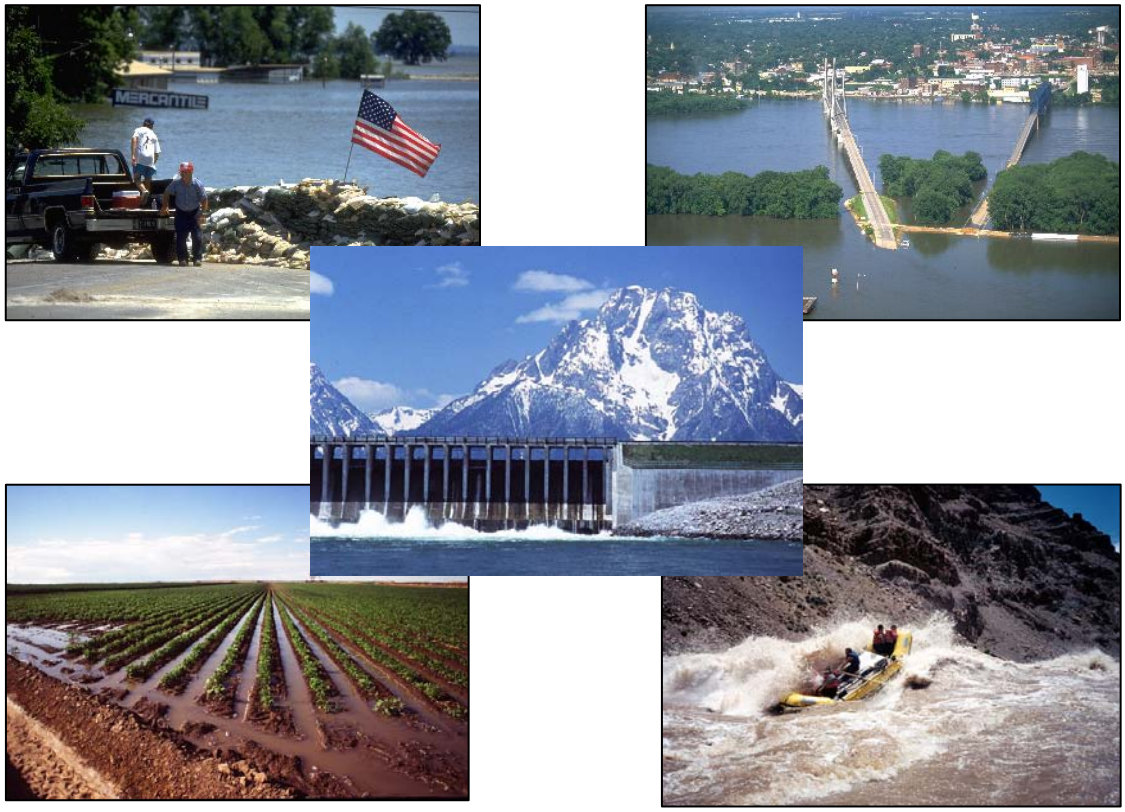
Advanced Hydrologic Prediction Service
Quarterly Report
3rd Quarter FY 2009



June 30, 2009

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Collaborative Research

On-going Competitive and Collaborative Research

(Grants and CREST)

Theme: Innovation

Management Lead: Pedro J. Restrepo

Objective: Coordinate the evaluation and management of the collaborative grants program

Milestones

Task	Due Date	Status
On-going competitive grants- Renewal	March 2006	Completed

1st Quarter FY08

- The Federal Funding Opportunity Announcement was published in the Federal Register at the end of December. The deadline for the submission of proposals on probabilistic river regulation is 1/28. We expect to convene a panel during the first full week of February and to issue a recommendation to Gary shortly after that.

2nd Quarter FY08

- Two proposals that address the River Regulation problem were recommended for funding. One of the proposals was already awarded, and the other should be awarded soon.

3rd Quarter FY08

- All proposals were awarded. OHD has now 5 on-going collaborative research projects with UCLA (2), New Mexico Institute of Mining and Technology, Aptima, Hydrologic Research Center; one Congressionally directed soft earmark to Boise State University; 2 matching grants to NOAA-CREST; One student fellowship to the U. of Texas, Austin.

4th Quarter FY08

- Projects are progressing.

1st Quarter FY09

- Received and approved progress reports. Prepared omnibus announcement of the December notice on the Federal Register.

2nd Quarter FY09

- Received 11 proposals for our omnibus announcement. Eight proposals were disqualified from the competition due to administrative non-compliance. The panel met on 3/27 and unanimously recommended one proposal for funding. We are conducting negotiations.

3rd Quarter FY09

- With the exception of one additional proposal for which we were able to find funds after the 6/30 deadline, all proposals were submitted to the Grants Management Division on time. All but 2 of those are finalized. The 2 still in progress are the Boise State earmark and the transfer of a grant from New Mexico Tech to Arizona State, which required special treatment.

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09 - None

3rd Quarter FY09 – Bugs in Grants Online delayed processing of grants.

Snow Science Plan

Core Goal: Innovation

Management Lead: Mike Smith

Objective: This proposal is meant to address issues raised by the Snow Science Steering Team (SSST) and Eric Anderson. These issues largely revolve around the need for a strategy for snow science directions. In general, NOHRSC and OHD agree that SNODAS and Snow-17 will continue to be used/ needed for the foreseeable future. However, a coherent strategy for addressing both common and unique needs is lacking.

Milestones

Task	Due Date	Status
1. Review existing plans and projects; determine snow plan updates	Q3	Work to start in Q3
2.		
3.		
4.		

Accomplishments/Actions

2nd Quarter FY09
- Funding approved

3rd QuarterFY09
- Eric Anderson provided comments on approved AHPS plan for SNODAS/Snow-17 project; Mike forwarded plan to NOHRSC for comments.

Problems Encountered/Issues

2nd Quarter FY09
- None

3rd Quarter FY09
- None

Quantify Uncertainty (Ensembles)

Data Assimilation for Muskingun Routing

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Dong-Jun Seo

Objective: Complete development of the prototype parameter estimation algorithm for the 3-parameter Muskingum routing technique and the prototype real-time assimilator of streamflow data.

Milestones

Task	Due Date	Status
1. Evaluate the parameter estimator toward simplification.	Q1	Complete
2. Complete testing of the assimilator. Design evaluation experiments (w/ WGRFC).	Q2	Complete
3. Carry out evaluation.	Q3	Complete
4. Start implementation of maximum likelihood ensemble filter (or its variant) in the prototype assimilator.	Q4	

Accomplishments/Actions

3rd Quarter FY09

- Carried out parameter estimation for the 3-parameter Muskingum routing technique of O'Donnell (1985) using the prototype algorithm for 4 river reaches in Texas
- Carried out evaluation of the prototype 1DVAR algorithm for real-time assimilation of streamflow data using the 4 river reaches in Texas

Problems Encountered/Issues

3rd Quarter FY09

- None

Improve 2DVAR to Address Performance under Timing Errors

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Dong-Jun Seo

Objective: Improve robustness of 2DVAR in the presence of timing errors due to uncertain UHG

Milestones

Task	Due Date	Status
1. Derive event-specific UHGs for multiple events for multiple basins	Q3	In progress
2. Model the probability distribution of phase error	Q3	In progress
3. Perform 2DVAR multiple times according to the above distribution and obtain the "ensemble mean" solution	Q4	
4. Carry out comparative evaluation with respect to the "best UHG" solution	Q4	

Accomplishments/Actions

3rd Quarter FY09

- Modified the AB_OPT program to allow event-specific derivation of empirical UHG
- Obtained additional data sets from OHRFC

Problems Encountered/Issues

3rd Quarter FY09

- None

Improve 4DVAR for Distributed Models

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Dong-Jun Seo

Objective: Improve computational efficiency and robustness of the prototype 4DVAR that assimilates streamflow, gridded precipitation, climatological PE and, if available, in-situ soil moisture data.

Milestones

Task	Due Date	Status
5. Collect data for basins in the ABRFC service area	Q1	Complete
6. Develop simplified formulation of 4DVAR.	Q2	Complete
7. Reduce dimensionality of the control vector in the prototype algorithm.	Q3	Complete
8. Collect data for basins in the WGRFC service area	Q4	
9. Carry out comparative evaluation.	Q4	

Accomplishments/Actions

3rd Quarter FY09

- Developed a new version of the prototype 4DVAR algorithm with reduced dimensionality of the control vector
- Designed experiments for evaluation of the above prototype for the basins in the ABRFC service area

Problems Encountered/Issues

3rd Quarter FY09

- None

Prototype Data Assimilation for SWE and StreamFlow/Runoff

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Dong-Jun Seo

Objective: **1)** Develop a snow and streamflow data assimilation (DA) strategy that synthesizes the cutting-edge DA science, and that is consistent with the current and envisioned operations concept at the RFCs, and
2) Develop a prototype data assimilator for SWE and streamflow/runoff for testing and Evaluation CHPS

Milestones

Task	Due Date	Status
10. Collect data (w/ NWRFC)	Q1	Complete
11. Set up CHPS for the study basins in the NWRFC service area	Q2	Complete
12. Begin simulation using CHPS for the study basins in the NWRFC service area	Q3	Complete
13. Set up regression-based snow updating for comparative evaluation	Q4	

Accomplishments/Actions

3rd Quarter FY09

- Set up the 5 study basins in the NWRFC service area in CHPS
- Started making simulations runs for the above basins using SNOW-17, SAC and UHG in CHPS
- Compared the above simulation results to those from NWRFC

Problems Encountered/Issues

3rd Quarter FY09

- None

eXperimental Ensemble Forecast System (XEFS)

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Geoff Bonnin

Objective: Implement an experimental short-to-long term hydrologic ensemble capability for use by all RFCs and which meets the recommendations provided by the "Design and Gap Analysis" report published May 11, 2007.

Milestones:

Task	FY08 Due Date	Status
XEFS Phase 1 Implementation: Pass OSIP Gate 1	FY09 Q2 (formerly FY08 Q2)	See new HEFS template
XEFS Phase 1 Implementation: Pass OSIP Gate 2	FY09 Q3 (formerly FY08 Q3)	See new HEFS template
XEFS Phase 1 Implementation: Pass HOSIP Gates 1, 2 and 3	FY09 Q3 (formerly FY08 Q4)	See new HEFS template
XEFS Phase 1 Implementation: Reconcile differences between prototype and operational Ensemble Post Processor (pass HOSIP Gate 3)	FY09, Q2	HOSIP P-2005-005 "Ensemble Post Processor Evaluation" in Stage 3
XEFS Phase 1 Science Algorithm Development: Pass HOSIP Gate 3	FY09, Q4	HOSIP P-2006-010 "Hydrologic Ensemble Preprocessor 3" in Stage 1
XEFS Science Infusion	TBD	HOSIP project P-2005-022 "VAR Verification, Validation & Enhancement" in Stage 3
Integrate prototype Ensemble Preprocessor 3 (EPP3) into CHPS	FY09, Q4	EPP3 and model adapters are under integration test
Integrate prototype Ensemble Post Processor (EnsPost) into CHPS	FY09, Q4	Not started
Integrate prototype HMOS into CHPS	FY09, Q4	Not started

Accomplishments/Actions:

1st Quarter FY08

- Budget discussions continued during this quarter.
- On October 19 HSEB submitted a "High Level Analysis and Design" document to the XEFS Implementation Team for review.
- In December HSEB held a meeting to address feedback received on the XEFS document. However the discussion prompted a re-think of the implementation strategy, which will now be based on Delft-FEWS in light of the CAT recommendation for CHPS.
- The HEP group continued its science discovery activities (these are reported under separate projects).

2nd Quarter FY08

- On January 17 the NOAA Hydrology Program Manager announced his approval of the Community Hydrologic Prediction System (CHPS) Acceleration Team (CAT) recommendation to proceed with implementation of the ready-made Deltares software package "Flood Early Warning System" (FEWS) as the infrastructure solution for CHPS. The draft XEFS software design, based on service-oriented concepts, must be adapted to accommodate FEWS as the infrastructure.

- Hence the XEFS implementation project is now heavily dependent on the CHPS implementation project; Deltares expects to play an important role in this effort later in the CHPS project cycle.
- Meanwhile HSEB began converting HSMB HEP's existing prototype software to the FEWS Pilot environment. The goal is to provide the HEP group with a CHPS environment for familiarization purposes and to facilitate the future ensemble science-to-operations path.
- The XEFS Execution Manager, Chris Dietz, delivered a draft version of the XEFS Implementation Plan to the XEFS Oversight Group for review and discussion; a final version of the plan is expected in Q3. This plan will provide input for the OSIP Gate 1 project plan.
- HOSIP project P-2007-019 has been delayed (refer to problems/issues below).

3rd Quarter FY08

- Preparation activities continued; some interactions with Deltares took place regarding FEWS capabilities
- Completed and delivered FEWS-based prototypes (EPP2, HMOS, etc.) to HSMB. Training provided. Intention is that HSMB will now continue XEFS prototyping activities in a CHPS environment instead of it alternative software structure.
- Completed port of most NWSRFS long-term ensemble components to CHPS. ESPADP will be more complicated; work will begin next quarter.
- The annual Hydrologic Ensemble Prediction Experiment (HEPEX) conference was held in Delft, Netherlands in June. Deltares continues to collaborate with the NWS on hydrologic ensembles.
- Activities related to ensembles capabilities in CHPS are not scheduled to begin until CY 2009.

4th Quarter FY08

- HSEB modified the NWSRFS climate-based ensembles application (ESPADP) to work with CHPS. This is a BOC requirement until XEFS is implemented.
- Hank Herr of HSEB formed a team and conducted an Ensembles Product Generator (EPG) project kick-off meeting on August 29. The goal is to define requirements for the EPG. Hank has begun the task of gathering all known ideas regarding desired ensemble products for users.
- OHD hosted a visit from Albrecht Weerts (Deltares ensembles focal point) during the week of September 8. Albrecht gave presentations and demonstrations of Delft-FEWS; he also reviewed preliminary plans for CHPS-based ensembles. Albrecht documented details for the CHPS Preparation Workshop #2 at NERFC in September (see status report for Core Goal #13 - CHPS).

1st Quarter FY09

- Deltares initiated routine (bi-weekly) conference calls with OHD to define how the requirements for XEFS map onto the FEWS-based CHPS architecture.

2nd Quarter FY09

- New HSEB Project Area Leader started in January: Mark Fresch
- OHD initiated weekly conference calls with XEFS Planning Team which includes members from Deltares, HSD, CNRFC, NWRFC, HSMB, and HSEB.
- Held planning and design discussions with Deltares. Deltares began implementing framework for EPG.
- EPG: completed draft high-level requirements and started Phase 1 design.
- XEFS EPP3 prototype was partially delivered, and integration into FEWS began.

3rd Quarter FY09

- A new and separate AHPS status sheet was created for implementing the Hydrologic Ensemble Forecasting System (HEFS), i.e. implementing new ensemble functionality into the operational baseline.
- The EPP3 prototype code has been nearly completed and model adapters have been written to enable EPP3 to run within CHPS. EPP3 and the model adapters are undergoing integration testing.

Problems Encountered/Issues:

1st Quarter FY08 - None

2nd Quarter FY08

- o Due to the requirement to implement a CHPS-based XEFS, HSEB in-house resources are necessarily focused on development of an operational CHPS before attention can be paid to an operational XEFS. Consequently, HSEB has only 1 software engineer (Hank Herr) assigned to the XEFS project. Deltares resources will not become available to assist the NWS with hydrologic ensemble forecasting until Q4 FY09. This delays the date of providing an experimental hydrologic forecast capability to all RFCs (as part of CHPS) until mid-2011 when CHPS is deployed. Milestones listed above have been adjusted accordingly.

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09

- Some AHPS due dates will need to be adjusted to reflect realistic schedules.

3rd Quarter FY09 - None

HEFS Phase I Implementation

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Jon Roe, Mark Fresch

Objective: Implement Phase 1 HEFS into the operational baseline, including the CHPS Graphics Generator, and XEFS components EPP3, EnsPost, HMOS, and Ensemble Verification Service

Milestones

Task	Due Date	Status
HEFS Phase 1 Implementation: Pass HOSIP Gate 1	FY09 Q3	Done; HOSIP P-2009-007 " Implementation of Hydrologic Ensemble Forecast Service (HEFS) Umbrella" in Stage 2
HEFS Graphics Generator: Pass HOSIP Gate 1	FY09 Q3	Done; HOSIP P-2009-011 "Hydrologic Ensemble Forecast Service (HEFS) Graphics Generator " in Stage 2
HEFS Graphics Generator: Pass HOSIP Gate 2	FY09, Q4	Not started
HEFS Graphics Generator: Pass OSIP combined Gate 1/2	FY09, Q4	Not started

Accomplishments/Actions

3rd Quarter FY09

- A new HOSIP project P-2009-007 "Implementation of Hydrologic Ensemble Forecast Service (HEFS) passed HOSIP Gate 1 was created to replace HOSIP project 2007-019, Experimental Ensemble Forecasting System (XEFS). The new HEFS project is the implementation of new ensemble related functionality into the CHPS baseline. Whereas XEFS encompasses several experimental ensemble sub-projects. The new HEFS project is an umbrella projects, and as a result, it will not continue through HOSIP. However, the XEFS components ready for implementation into the CHPS operational baseline will be sub-projects of the HEFS umbrella project which will go through HOSIP and OSIP. The Graphics Generator is the first of these sub-projects and also passed HOSIP Gate 1 during the quarter.

Problems Encountered/Issues

3rd Quarter FY09

- None

NCEP Collaboration (THOPEX)

Core Goal: Quantify uncertainty of our forecast information

Management Lead: Dong-Jun Seo

Objective:

1) Accelerate development of reliable and skillful hydrometeorological (precipitation, temperature and potential evaporation) ensemble forecast products for hydrology and water resources applications
2) Fast-track infusion of new and improved hydrometeorological ensemble and probabilistic guidance products into the RFC operations through the EXperimental Ensemble Forecast System (XEFS)

Milestones

Task	Due Date	Status
14. Implement stochastic perturbations into ensemble integrations of GEFS.	Q4	
15. Increase resolution for GEFS (from 110 to 70 km) and SREF (from 40 to 32 km) ensembles.	Q4	

Accomplishments/Actions

3rd Quarter FY09

-

Problems Encountered/Issues

3rd Quarter FY09

-

Gridded Water Resources

Distributed Model - SAC-SMA Parameters

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: The objective of FY08 work will be to conduct research on usage of SSURGO data and verify whether the use of the data can improve current SAC-SMA parameter estimation and further our distributed modeling. Download data for various projects. Procedures will be developed to store and process the massive data sets.

Milestones

Task	Due Date	Status
Evaluate performance of SSURGO-based and STATSGO based parameters on soil moisture simulation over DMIP 2 basins where data available.	FY09 Q3	In process
Derive and test a priori parameters by using combination of STATSGO and Curve Number Grids	FY07 Q3	complete
Complete hydrograph analysis of STATSGO-SSURGO parameters and hydrologic simulations, journal paper and RFC recommendations.	FY09 Q3	Analysis completed; paper draft for comments
Derive SSURGO parameters for remaining states (including Hawaii, Alaska and Puerto Rico if possible)	FY09 Q3	CONUS Complete; Puerto Rico In process

Accomplishments/Actions

1st Quarter FY08

- Ziya Zhang ran simulations using new parameter sets on **16** basins, and started results analyses for a journal paper which is under preparation.

2nd Quarter FY08

- Ziya Zhang nearly done with analysis of simulations from SSURGO and STATSGO parameters. HOSIP Stage III plan conditionally approved March. Yu Zhang and Seann Reed helped APRFC derive SAC parameters for Hawaii. Yu provided the processing scripts to APRFC. The RFC gathered the SSURGO data and use land use / land cover data from a local university in the absence of the USGS LULC data. Processing nearly complete: now need to aggregate up to 4km scale. Assessed availability of STATSGO and SSURGO data for Puerto Rico and provided this update to SERFC.

3rd Quarter FY08

- Ziya Zhang has completed the comparison of a priori SAC parameters based on SSURGO and STATSGO soil data and analysis of simulations for 16 selected basins using derived parameters. Draft paper has been finished for group members to comment. Results were presented in Spring AGU (2008) meeting and DOH conference. Ziya Zhang started work with Yu Zhang to derive SSURGO based SAC parameters for the rest of CONUS.

4th Quarter FY08

- Ziya Zhang has downloaded available SSURGO data (as well as land cover data) for the rest of CONUS. Started deriving SSURGO-based a priori SAC parameters.

1st Quarter FY09

- Ziya Zhang derived SSURGO-based a priori SAC parameters for 23 states in the scales of HRAP, half HRAP and a quarter HRAP. The result grids only cover CONUS where data are

available so far. Newly derived grids need to be combined with those derived before for the rest of CONUS states.

2nd Quarter FY09

- Ziya Zhang derived SSURGO-based a priori SAC parameters for 23 states and combined with the results for 25 other states after correcting some problems. Applied climate adjustment factors from STATSGO parameters to newly derived SSURGO-based a priori SAC parameters covering CONUS. Filled the missing values from STATSGO-based a priori SAC parameters. A new mask grid is created to tell users whether the value for a specific grid cell is SSURGO-based or STATSGO-based or is water body (as missing values).
- Ziya began work on Puerto Rico SSURGO parameters.

3rd Quarter FY09

- Ziya Zhang has finished deriving SSURGO-based a priori SAC parameters for CONUS and delivered the grids to RFCs and other users to use.
- Ziya Zhang finished a draft paper on the comparison of SSURGO-based and STATSGO-based a priori SAC parameters and their effect on distributed modeling and soil moisture estimates.

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08

- Disk space problem has been resolved and 150GB of disk space became available. Final derived SAC parameters may not cover all counties for some states due to the SSURGO data unavailability. These holes can be filled later once the SSURGO data become available

1st Quarter FY09

- Ran out of disk space during the data process. Additional disk space of 100GB was requested. Some of procedures were run twice due to a header error in scripts.

2nd Quarter FY09

- Uncovered a geographic projection problem caused either by HRAP window not being big enough at the beginning (for the case of state Maine) or the initial USGS land cover (1992) as a template was not compatible with 2001 data set (for the case of state Florida). The problem associated with Florida caused extra work of re-processing previously processed data of 25 states.
- Given the climate adjusted parameters, need to recompute the frequency plots of parameters over CONUS for summary paper.
- Scripts and programs used to derive SSURGO parameters for CONUS didn't apply to Puerto Rico due to HRAP coordinates being limited.
- Discovered that OHD does not have the intermediate data on hand containing soil texture data. These data would be good to have for SAC-HT and future parameterization work.

3rd Quarter FY09

- Due to the introduction of a new algorithm to estimate one of the SAC parameters, it's necessary to download raw SSURGO data for all states. Disk space needs to be resolved before downloading and processing the SSURGO data.

Distributed Model - Evaluate New Parameter Approaches

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: The objective will be to evaluate a parameter regionalization approach for SAC and Snow-17 using lumped calibrated parameters. Value of soil moisture data for evaluation and calibration of *a priori* parameters will be also analyzed.

Milestones

Task	Due Date	Status
1. Derive relationships between lumped calibrated SNOW-17 parameters and watershed properties	Mar. 31, 2005	On schedule
2. Generate SNOW-17 parameter grids over Susquehanna River basin	Apr. 30, 2005	On schedule
3. Evaluate and calibrate derived SNOW-17 parameter grids using snow observations and streamflow	Dec. 30, 2005	On schedule
4. Evaluate *a priori* SAC-SMA parameters over Oklahoma mesonet using runoff and soil moisture data at different spatial scales	Sep. 30, 2005	Completed April 2005
5. Initial evaluation of possibility of using soil moisture data to calibrate *a priori* SAC-SMA parameters	Sep. 30, 2005	completed
6. Develop a physically-based procedure to derive *a priori* values of the most critical SNOW-17 parameters over CONUS	Mar 30, 2006	Completed for MF-max, MF-min.
7. Evaluate *a priori* STATSGO-based SAC parameters over selected regions (e.g., Oklahoma) by comparing to available measurement (e.g., soil moisture, runoff, evaporation)	May 31, 2006	completed
8. Analyze effect of climatological PE on the water balance simulation results, and develop a calibration approach of the spatial adjustment of climatological PE grids. Modify HL-RDHM code to incorporate developed PE calibration approach.	FY08 Q4	completed
9. Test PE adjustment approach on a large region, e.g., Oklahoma Mesonet using soil moisture data.	FYO8 Q4	completed
10. Perform calibration of SAC parameters, and analyze their relationships to *a priori* and climatologic indexes	~~July 31, 2006~~ FYO8 Q4	completed
11. Test SAC and SNOW-17 derived parameters over uncalibrated areas/basins	FY07 Q1	Snow-17 initial tests of 2 parameters nearly complete. Being done in DMIP2 western basins.
12. Evaluate soil moisture simulations over DMIP2 basins from lumped and distributed models.	FY07 Q3	Completed in Q4 for DMIP 2
13. Extend analysis and tests of a climate adjustment to *a priori* parameters (increase time period and basins)	~~Q3~~ FY09 Q1	complete
14. Compare long-term climatologic variables (precipitation, evapotranspiration) to their averages over shorter test periods, and evaluate effect of their differences on the climate adjustment factors.	~~Q3~~ FY09 Q1	Complete
15. Test PE adjustment approach to large region i.e., uncalibrated areas/basins from lumped and distributed simulation results.	~~Q3~~ FY09 Q2	~~In progress~~ Not funded by AHPS for FY09

16. Investigate other sources of Snow-17 *a priori* parameter ranges: use energy budget model results	FY08 Q4	Complete for MFMAX and MFMIN
17. Derive and test first-cut *a priori* values of Snow-17 parameters SCF and UADJ	~~FY08 Q2~~ FY08 Q4	Monthly values derived for CONUS; move completion date
18. Evaluate new ZPERC algorithm, provide recommendations to RFCs. Deliver new ZPERC grid via CAP	~~FY08 Q4~~ ~~FY09 Q1~~	ZPERC completed; delivery In progress
19.		

Accomplishments/Actions

1st Quarter FY05

- Task 1: Similar analysis was performed for Cont-API model
- Task 4: Runoff and soil moisture data for the Oklahoma mesonet region are collected.

2nd Quarter FY05

- Task 1. Basic relationships developed.
- Task 2, 3. Completed. Fekadu Moreda and Zhengtao Cui delivered distributed model and all parameter grids to MARFC. Fekadu presented paper on this work at the conference of the International Association of Hydrologic Science (IAHS) in Brazil in April.
- Task 4. Ziya Zhang has acquired and processed fine scale soils data for the Oklahoma areas. Victor completed this task and presented work at the conference of the International Association of Hydrologic Science (IAHS) in Brazil in April.

3rd Quarter FY05

- Victor and Fekadu tested the distributed model for a multiyear period over the OK. Mesonet domain to evaluate against soil moisture estimates from the NLDAS project run by NCEP.

4th Quarter FY05

- Victor extended the analysis of Oklahoma Mesonet simulation results. Developed climate adjustment factor to modify the existing a-priori parameters. A grid of these adjustment factors was developed for CONUS. Testing with OK Mesonet soil moisture justifies again the physics of the modified SAC-SMA model. Hypothesis is that the climate index can improve a-priori parameter identification and thus simplify the calibration of distributed and other models.

1st Quarter FY06

- Developed CONUS data set of *a priori* parameters for Snow-17 based on Eric Andersons initial suggestions.

2nd Quarter FY06

- Ongoing work on evaluation and calibration Sacramento parameters over Oklahoma region and 20 selected river basins. Distributed and lumped approaches are used in these tests. Tests of climate adjustments are ongoing.

3rd Quarter FY06

- Published two papers (IAHS Red Book) on evaluation of *a priori* SAC parameters over the Oklahoma mesonet region.
- Extended analysis of *a priori* parameter performance over Oklahoma mesonet basins for lumped-based simulations using runoff and soil moisture measurements.
- Soil moisture measurements were incorporated into the automatic calibration process as an additional performance measure. Preliminary results suggest that the use of soil moisture data can improve a parameter estimation procedure and reliability of model parameters. They are also helpful in manual calibration to be sure that 'good results are achieved for scientifically sound reasons'.

4th Quarter FY06

- More soil moisture tests were performed at 2 New Mexico sites. These tests led to development of an approach that allowed rescaling of soil moisture states simulated using HRAP scale *a priori* parameters into point soil moisture states by using local soil properties (porosity and wilting point). It has potential for simulation/prediction of soil moisture at a local scale. However, wide range tests need to be performed.

1St Quarter FY07

- SAC-HT: Additional soil moisture tests conducted at the request of New Mexico State researchers (for the Economics Study of the NOAA Water Resources program). The developed approach to rescale soil moisture states simulated using HRAP-scale *a priori* parameters into point soil moisture states by using local soil properties was tested for 48 Oklahoma Mesonet soil measurement sites. These simulations show much higher accuracy at Mesonet sites comparing to just use of HRAP-scale *a priori* parameters without rescaling. This shows promise for end-users to get site-specific soil moisture information during coarse-scale (i.e., 4km grid) executions of the SAC-HT model. End-users can obtain local soil properties from field-collected soil samples or perhaps SSURGO data would be useable.
- Snow-17: Developed CONUS estimates of MF-MAX, MF-MIN using Eric Anderson's recommended ranges modified by topographic attributes such as aspect and forest cover. Delivered estimates to CBRFC. Began testing parameters for selected areas in the Juniata River basin (MARFC).

2nd Quarter FY07

- Developed CONUS Sacramento model parameters from STATSGO data and variable NRCS Curve Number (CN). Parameters developed at 1km and 4km scale. Developed parameters for Maryland to support Baltimore Flash Flood Project with DHM-TF. Began initial evaluation of the STATSGO parameters with/without variable CN.
- Obtained calibrated SNOW-17 parameters of several basins from ED Clark (CBRFC). Started comparing these parameters with *a priori* Snow-17 parameters.
- Updated HOSIP documents to reflect the current status of these tasks.
- Investigators at U. New Mexico report 'promising' results using Victor's soil moisture simulations for an agricultural economics study. Draft journal paper being prepared.

3rd Quarter FY07

- Victor Koren performed analyses and prepared presentation on the use of soil moisture observations for calibration for IUGG conference in Italy, July 2007.
- Reviewed draft report from U. New Mexico: "Exploratory Case Study on the Value of Improving Soil Moisture Forecast Information for Rangeland Management" which showed the value of soil moisture data from the SAC-HT model.

4th Quarter FY07

- Victor completed analysis of using soil moisture data to aid model calibration. Victor developed paper from July IUGG conference and submitted to Journal of Hydrology for publication. Results showed that more consistent SAC model parameters can be developed when using additional data for calibration (not just basin outlet streamflow)
- Received request to provide CONUS 1/8 degree scale SAC parameters for NCEP's North American Land Data Assimilation System (NLDAS) project. This will provide more independent testing and evaluation of the soils-based parameters at a national scale.
- Began testing of *a priori* Snow-17 parameters in western DMIP 2 basins.
- Completed analysis of distributed model soil moisture simulations for DMIP 2. Presented results at DMIP 2 workshop September 10-12, 2007.

1st Quarter FY08

- Evaluated *a priori* grids of MFMAX and MFMIN over DMIP2 basins.
- Processed CONUS-wide NARR wind data and generated monthly climatological grids. A preliminary HRAP grid of UADJ parameter was generated using these climatological grids.

2nd Quarter FY08

- Developed new approach to derive ZPERC SAC parameter from infiltration theory and first principles. Delivered SAC and SNOW-17 parameters for DMIP 2 western basins to NASA for testing in the NASA Land Information System. Monthly UADJ and SCF grids (October through June) have been created for CONUS. They are under evaluation. Used simplified energy-budget snow model equations to derive another set of MFMAX and MFMIN parameters for CONUS: evaluation underway.

3rd Quarter FY08

- Obtained DEM and forest grid to start investigation on a snow-17 parameterization for Alaska
- Completed MFMAX and MFMIN parameters for CONUS with simplified energy-budget snow model and Naoki Mizukami presented the methodology in National DOH conference. The parameter grids were also created at 1/2 hrap for mountainous regions. Evaluation still underway.

4th Quarter FY08

- Completed the first phase of climate adjustment to a priori PE and SAC-HT parameters. Technical note on this analysis is close to finish. The next step will be application of the adjustment to regional/CONUS a priori grids and testing in lumped and distributed modes.
- Completed preliminary MFMAX and MFMIN grids for Alaska using simplified energy budget model. Next step, ratio of MFMIN to MFMAX needs to be evaluated to refine parameter values for Alaska and possibly for CONUS.

1st Quarter FY09

- Prepared a Technical note of the first phase of climate adjustment to a priori PE and SAC-HT parameters. Generated CONUS grids of adjusted UZTWM and LZTWM parameters. Started tests of the climate adjusted parameters.
- Victor presented his lumped model results with newly derived climate adjusted parameters in dry areas. Presentations made to RFCs and OHD.
- Modified the melt factor parameterization methodology (aforementioned as energy-budget based temperature index model) based on the results of observed snow data analysis. Recomputed MFMAX and MFMIN parameter grids for CONUS (1 hrap, ½ hrap, ¼ hrap) and Alaska (1 hrap). Naoki Mizukami presented the methodology and evaluation in AGU conference. Computed monthly UADJ parameter grid for Alaska.

2nd Quarter FY09

- Revised energy-budget based temperature index model based on documents obtained from Russia. Recomputed MFMAX and MFMIN over CONUS and Alaska based on the revised model. Recomputed UADJ with winter month average wind for CONUS and Alaska. Extend the grid domain to Canadian potion of RFCs. Started evaluation (comparison with lumped parameter, sensitivity tests).

3rd Quarter FY09

- Analyzed sensitivity of streamflow simulation to parameters (MFMAX and MFMIN). Tested scaling effect on simulation, random error effect on simulation. Started writing a separate paper (from SNOW17 melt factor parameterization paper) regarding this analysis.

Problems Encountered/Issues

1st Quarter FY05 - None

2nd Quarter FY05 – None

3rd Quarter FY05 – None

4th Quarter FY05 - None

1st Quarter FY06 – None

2nd Quarter FY06 - None

3rd Quarter FY06 - None

4th Quarter FY06

- Planned work delayed to work on SnowMIP and New Mexico soil moisture simulations to support Water Resources Economics study. However, the use of soil moisture in the auto-calibration process and a technique of relating point-to-grid soil textures from the New Mexico work will lead to better calibrated parameters to use in the analysis of a climatological adjustment.

1st Quarter FY07

- Delays again due to additional tests requested by the New Mexico Economics study.

2nd Quarter FY07 - None

3rd Quarter FY07

- Hydro group currently managing over 30 projects; OHD prioritization needed to reduce workload.

4th Quarter FY07

- PE adjustment of parameters delayed due to Cold Regions workshop, DMIP 2 gridded data derivation for FY07 OHD AOP item, results analysis, preparation of OHD Science Plan, and other projects.
- Fekadu Moreda leaving Hydrologic Modeling Group to join River Mechanics group. Fekadu worked on the *a priori* estimates of the Snow-17 parameters. Replacement won't start until November 13, 2007

1st Quarter FY08 - None

2nd Quarter FY08

- Testing of *a priori* Snow-17 parameters SCF and UADJ delayed due to group turnover and need to analyze DMIP 2 precipitation data sets for HMT testing.

3rd Quarter FY08 - None.

4th Quarter FY08 - None

1st Quarter FY09 – None

2nd Quarter FY09 - None

3rd Quarter FY09 – Issue with SCF parameterization - difficulty in relating physical basin characteristics and parameter values. Hold off this task. Slight delay due to new DMIP2 QPE analysis, Red River flooding investigation

Snow Model - Plans for using SNODAS Output

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Michael Smith

Objective: Develop plan and approach to use SNODAS output to generate run-time modifications to Snow-17 in operational setting.

Milestones

Task	Due Date	Status
1. Review existing Snow-17 modifications	May 2006	completed
2. Familiarization with SNODAS processes and products	July 2006	Complete
3. Devise approach	Aug 2006	Draft plan delivered 9/06
4. Acquire data & write draft code	Sept 2006	On hold
5. Test approach.	Nov 2006	On hold
6. Allocate funding for 4 months ($50K) for a contractor to support the SSST. Locate contractor	FY08 Q3	On hold
7. Support SSST by developing draft plan	Q4	

Accomplishments/Actions

1st Quarter FY06
- No work this period

2nd Quarter FY06
- Developed draft outline of tasks and approach (no. 3 above), gave to Eric for comment after his return to Virginia in March.

3rd Quarter FY06
- Eric Anderson began in-depth planning of project; began coordinating with NOHRSC on details of data and SNODAS model outputs. Eric completed the review of run-time mods such as those with AESC.

4th Quarter FY06
- Eric completed draft plan. Sent to OHD for review. Final plan will be submitted in October 2006.

1st Quarter FY07
- AHPS funding of $38K approved for HL portion of this work.

2nd Quarter FY07
- The Snow Science Steering Team needs to approve this project

3rd Quarter FY07
- The Snow Science Steering Team needs to approve this project. Discussions at the August Cold Regions workshop may lead to a plan or decision for this work.

4th Quarter FY07
- This project was briefly discussed at the Cold Regions Hydrology (CRH) Workshop in August. No word yet on the actions to be taken from the CRH workshop.

1st Quarter FY08
- Need approval from the Snow Science Steering Team prior to continuing the project

2nd Quarter FY08
- Determined that OHD needs to develop a more concise plan for the direction of the NWS Snow Hydrology program

3rd Quarter FY08
- See issues

4th Quarter FY08
- See 'issues' section.

1st Quarter FY09
- Mike prepared FY09 AHPS plan based on Eric Anderson's recommendations. Submitted plan to the AHPS/Water Resources Innovation Theme team for consideration. Sent AHPS plan to Don Cline to keep him in loop.

2nd Quarter FY09
- AHPS funding for this project appears likely.

3rd Quarter FY09
- AHPS funding approved for this project. Eric Anderson provided updates to plan and sent to Don Cline and OHD.

Problems Encountered/Issues

1st Quarter FY06
- No work started as Eric was finishing Snow-17 coding changes and final documentation. Also, the AHPS funding amounts weren't finalized.

2nd Quarter FY06 - None

3rd Quarter FY06 - None

4th Quarter FY06
- Snow Science Steering Team created to provide overall direction. This project is included in the list of all OHD, NWS. NOHRSC plans for coordination. Data needed for this project is not available will have to be generated via 'Re-analysis' at NOHRSC; may be a large effort. (note: AHPS SLF Theme Team assigned this item a fairly high priority.)

1st Quarter FY07
- The Snow Science Steering Team needs to approve this project.

2nd Quarter FY07
- The Snow Science Steering Team needs to approve this project

3rd Quarter FY07
- The Snow Science Steering Team needs to approve this project

4th Quarter FY07
- The Snow Science Steering Team needs to approve this project

1st Quarter FY08
- Need approval from the Snow Science Steering Team prior to continuing the project

2nd Quarter FY08

- Determined that OHD needs to develop a more concise plan for the direction of the NWS Snow Hydrology program

3rd Quarter FY08

- SSST has not acted on Eric Anderson's emails and recommendations.

4th Quarter FY08

- SSST has not acted on Eric Anderson's emails and recommendations. Mike will re-submit this plan for FY09.

1st Quarter FY09

- None

2nd Quarter FY09

- none

3rd Quarter FY09

- Project would benefit from having NOHRSC review Eric's most recent suggestions to the plan.

Auto Calibration for Distributed Model

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: The objectives of this work include developing tools and procedures for auto-calibrating the RDHM to generate parameters for the AWIPS DHM delivered in OB7.2. Two phases are identified for this area of research. First, initial work will focus on auto-optimization of the scalar multipliers of all the gridded parameters (SAC, Snow-17, and routing) so that all parameters are adjusted uniformly. This was done manually in DMIP 1 with good success. A prerequisite for this work is the development of sound lumped hourly parameters. Second, future funding will support work to optimize individual gridded parameters for groups of grids. FY07 work dovetails with the DMIP 2 and other projects.

Milestones

Task	Due Date	Status
1. Modify RDHM to be called by a generic 'wrapper'	FY07 Q2	complete
2. Test initial auto calibration with OK DMIP 2 basins.	FY07 Q2	complete
3. Explore performance issues in context of DMIP 2	FY07 Q4	complete
4. Evaluate multi-time scale objective function.	FY07 Q2	complete
5. Test Rosenbrock and/or Davidon-Fletcher-Powell search algorithms	FY07 Q3	Put on hold
6. Automatic calibration extended to lumped Snow-17	FY08 Q1	Complete
7. Investigated separate procedures for elevation zones for mountainous areas.	FY08 Q4	In progress
8. Evaluate combined automatic and manual calibration strategy	~~FY08 Q4~~	Complete for non-snow basins; in progress for basins including snow
9. Develop outline for overall strategy for distributed model calibration	FY08 Q3	In progress
10. Develop approach for auto calibration of elevation zone parameters	FY09 Q1	Plan developed; submitted to AHPS

Accomplishments/Actions

1st Quarter FY07

- Developed initial HL-RDHM 'wrapper' algorithm to test various minimization approaches.

2nd Quarter FY07

- Simple direct search algorithm added to 'wrapper' to find best parameter scalar multipliers. This was tested for DMIP 2 with good success. Rosenbrock search algorithm is being tested now. Additionally, a promising new search algorithm developed in 2006 called Dynamically Dimensioned Search (DDS) was located and the code obtained for use free of charge. Coding advances in HL-RDHM were provided to HSEB.
- Developed HOSIP documents for this project.

3rd Quarter FY07

- HL-RDHM with calibration feature presented to all RFCs at the June distributed modeling workshop at ABRFC. Training provided to workshop participants. Minor bugs corrected and continued streamlining of the procedure achieved.

4th Quarter FY07

- HL-RDHM with calibration feature testing in DMIP 2 Oklahoma basins; showed good performance evidenced by comparing results to other models.
- Paper on use of simplified search algorithm and soil moisture data using multi-time scale objective function prepared.
- Hydro modeling group began Multi-step Automatic Calibration Strategy ('MACS') type calibration procedure combining manual calibration with automatic calibration in an iterative process. This used in DMIP 2.
- Presented multi-time scale objective function to DMIP 2 participants at DMIP 2 workshop; several participants want to use it.
- Field support of RFC use of calibration tool

1st Quarter FY08

- RDHM automatic calibration module was restructured (mostly dealing with parametric data and model states) that led to significant reduction in run time.
- Automatic calibration was extended to SNOW17 operation and tested for DMIP2 basins.
- Created off-line scripts to perform zone adjustment of RDHM parametric grids. This approach was tested for the Carson basin in manual calibration of SAC-SMA and SNOW17 models. Linkage to RDHM software needs to be performed for an automatic option.

2nd Quarter FY08

- Planned work put on hold until strategy for distributed model calibration developed. Mike to develop initial outline.

3rd Quarter FY08

- None

4th Quarter FY08

- Mike and Victor reviewed U. Arizona DMIP 2 journal paper reporting on use of *a priori* parameters, regularization, multi-objective optimization, and spatially-variable parameter adjustment for distributed model calibration. Hydro group will review and make recommendations as part of DMIP 2 results analysis.

1st Quarter FY09

- Victor prepared revised AHPS/Water Resources plan for scaling based on elevation zones or other defined property. Mike presented Victor's plan to the Distributed Modeling Team.
- Evaluated DMIP 2 western basin results. OHD's calibration strategy produced very reasonable results compared to other DMIP 2 participants.

2nd Quarter FY09

- Hydrogroup studied various papers on calibration of distributed models.

3rd Quarter FY09

- Mike began ideas for HOSIP SON to incorporate U. Arizona's work on calibration strategies.
- Zhengtao and Victor added the frozen ground options to the existing auto-calibration component of HL-RDHM and posted updated code on AWIPS LAD.

Problems Encountered/Issues

1st Quarter FY07 - None

2nd Quarter FY07

- Long HL-RDHM calibration run times noticed. This was solved by adding code from the older HL-RMS to the new version HL-RDHM so that the calibration routines execute a streamlined version of the distributed model.

3rd Quarter FY07 - None

4th Quarter FY07

- Planned activities such as testing the Rosenbrock search procedure delayed due to other projects' priority.

1st Quarter FY08 - None

2nd Quarter FY08

- Planned work put on hold until strategy for distributed model calibration developed. Mike to develop initial outline.

3rd Quarter FY08

- The development of a strategy for distributed model calibration may need to be coordinated via the to-be-formed Distributed Modeling Investment Team.

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09

- No funding for contractor support provided for FY09.

3rd Quarter FY09

- Limited work until SON is developed for U. Arizona's work.

Distributed Modeling Spatial Display and Analysis Tool (DHM-SDAT)

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: Analyze existing display tools for Distributed Hydrologic Modeling.

Milestones

Task	Due Date	Status
1. Coordinate with Distributed Modeling Gap analysis team and the data assimilation work within the XEFS project.	TBD	Team being formed
2. Investigate existing display tools for gridded data to be used in research and in prototype testing.	FY09 Q1	Complete

Accomplishments/Actions

1st Quarter FY08
- Project initiated

2nd Quarter FY08
- Team being formed to perform a survey of existing tools to support distributed modeling spatial display and analysis

3rd Quarter FY08
- Investigated potential for using GrADS visualization software to view DHM-TF output. Software is versatile and performs well, but can only display HRAP output in an interpolated lat/lon view.
- Examined GRASS GIS as a platform for visualizing DHM-TF output. Although featuring a steeper learning curve than GrADS, the software can directly display DHM-TF output on the native HRAP grid, as well as ingest relevant hydrological and geographic shape files.
- This work to be coordinated via the to-be-formed Distributed Model Investment Team

4th Quarter FY08
- Created several GRASS GIS scripts for automated and simple-interactive viewing of DHM-TF output
- Started initial investigation of Google Earth and AWIPS as two possible means of visualizing DHM-TF output data. Investigated CHPS (FEWS) display of gridded information. Configured FEWS to display gridded XMRG time series in GRIB format successfully. However, the configuration for FEWS to display gridded time series in ArcInfo ascii raster format was not successful.

1st Quarter FY09
- Refined GRASS GIS scripts for viewing of DHM-TF data
- Created several Google Earth scripts for automatic generation of KML formatted files necessary for viewing DHM-TF data within Google Earth
- Created Fortran programs which can be used to reformat any gridded or point data into KML format for viewing in Google Earth
- Worked with OHD personnel to obtain in-house XrmgViewer software to view XMRG formatted files. Currently testing software to determine potential usefulness.

2nd Quarter FY09
- Refined Google Earth Fortran conversion programs, making them general enough for use with

most HRAP/XMRG files.

3rd Quarter FY09

- Continued to refine Google Earth Fortran conversion programs, expanding their flexibility and capabilities.
- Presented a Google Earth GoTo meeting detailing the usefulness of Google Earth to hydrologic visualization efforts
- Consulted with several WFOs regarding their openness to using Google Earth to visualize DHM-TF output versus another method such as D2D. Response has been positive.

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08

- Need to coordinate with investigation of GFE. Mary Mullusky says that personnel associated with GFE are very interested in hydro requirements.

1st Quarter FY09 - None

2nd Quarter FY09

- No FY09 funding for contractor support.

3rd Quarter FY09 - None

Distributed Model Intercomparison Project (DMIP II)

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: Develop then Refine Gridded Water Resources Products.

Milestones

Task	Due Date	Status
1. Complete analysis of simulations from the Oklahoma experiments	Q4	On track
2. Submit papers for DMIP 2 Special Issue	Q4	On track
3. Design OK forecast mode experiment	FY09 Q1	On track
4. DMIP 2 Western Basin Experiments: generate and analyze basic (w/o HMT data0 distribute and lumped simulations	FY09 Q1	On track
5. DMIP 2 Western Basin Experiments: HMT QPE, temperature, and freezing level data analysis and use in distributed and lumped models	FY09 Q1	Most likely delayed due to OHD and HMT precipitation problems
6. OHD support for DMIP 2 participants	ongoing	On track

Accomplishments/Actions

1st Quarter FY08

- Completed Western Basins lumped and distributed simulations using HL-RDHM with Snow-17 at one hour time step. Begin to analyze the HMT QPE estimates. Sent out summary of DMIP 1 results in Oklahoma to RFCs and Regions.

2nd Quarter FY08

- Received all final simulations from Ok. participants. Began writing journal papers. OHD Hydromet group performing MPE analysis of NSSL/ESRL 'merged' radar QPE with in situ rain gauge data. Final product will be 'best' QPE from HMT gap filling radar.

3rd Quarter FY08

- Wrote paper for DMIP 2 Special Issue on the overview of the Oklahoma experiments. Began writing the overall results paper. Results confirm that OHD model is very sound.
- OHD co-chaired a session at Spring AGU in Florida on DMIP 2 results. Mike gave invited presentation on OHD distributed modeling.
- OHD tested HMT radar QPE's from the NSSL SmartR and ESRL-XPOL radars from the 2005-2006 period. This effort used MPE to bias-adjust the radar fields using 12 rain gauges. These data sets were successfully run through the OHD distributed model, showing that the proposed method of evaluating the HMT 'gap filling' radar QPEs is valid.
- Mike and Dave Kitzmiller attended annual HMT workshops in Sacramento.
- Ezio Todini from Italy and U. Arizona will submit western basin simulations.

4th Quarter FY08

- Ezio Todini from Italy submitted western basin simulations.
- Mike presented Oklahoma and Western basin results at July DOH conference.
- Mike and Hydro-group writing the overall results journal paper for the Oklahoma experiments.
- Mike coordinated DMIP 2 journal papers for the Journal of Hydrology Special Issue.
- Vrije U. of Brussels will continue their participation with a new PhD student; will develop soil moisture simulations per DMIP 2 modeling instructions and submit them to OHD.

1st Quarter FY09

- Began preliminary evaluation of all participants' simulations for western basin experiments. A wide range of performance was noted by the models for the two western basins. The OHD results are very reasonable in comparison.
- Mike prepared presentation on DMIP 2 results for AMS conference session on 'Comparison of Distributed Models'. Mike will also chair the session.
- Provided reviews and Guest Editor comments on several DMIP 2 journal papers.
- Mike continued to write the overall results paper for the Oklahoma experiments
- Mike and student of Ezio Todini from Italy discussed their modeling approaches.

2nd Quarter FY09

- Hydro and Hydromet groups in OHD developed plan to use the calibration MAP preprocessor and MPE to generate gridded QPE fields as a second approach. The MAP preprocessor was modified to output complete hourly time series of precipitation at NCDC and Snotel sites. Initial testing of these point time series shows promise. These data will then be fed into MPE. A small data set consisting of four station data was used for preliminary testing of MPE to generate a gauge-only QPE field.
- Work began in earnest to fix the previous QPE derivation problems and generate a new data set in the west. Initial delivery of gridded QPE data for 2001-2006 in April.
- DMIP 2 Special Issue of the Journal of Hydrology: submitted papers were pushed through the review process. OHD papers being refined. Murugesu Sivapalan will submit two papers.
- ABRFC gridded QPF data acquired for DMIP 2 forecast experiments.

3rd Quarter FY09

- Revised QPE data set (2001-2006) for the Western Basins delivered. Initial analysis shows that the North Fork American River data are reasonable, but the data for the East Fork Carson river are not. The East Fork Carson River data seem to be inconsistent over time.
- Hydromet and Hydrogroups derived another approach to compute gridded gauge-only QPE in the mountains: Use point hourly time series from NCDC and SNOTEL stations as input to MPE to compute a gauge-only gridded field. This method was successfully tried last year with for a 3 month simulation period using 12 hourly stations around the North Fork. Mike and Zhengtao modified the Calibration MAP preprocessor to write out hourly time series generated at hourly and daily station locations. These are being used as input for MPE. If found to produce good QPE estimates, this approach is can be easily used in the field as it is based on existing and known algorithms.
- Mike and Hoshin Gupta continued to process papers for the Special Issue of the Journal of Hydrology covering the Oklahoma experiments.
- Coordination meeting held with Marty Ralph, Tim Schnieder, David Kingsmill (ESRL) and OHD to map out tasks to get best forcing data for DMIP 2 Western Basins. Data requirements were reviewed and plan was developed. Gary Carter approved plan. Radar–based QPE for the western basins will be developed with David Kingsmill leading the effort.

Problems Encountered/Issues

1st Quarter FY08

- Two Hydro group members transferred to other OHD HSMB groups.

2nd Quarter FY08

- Gauge only gridded precipitation and temperature data found to have problems. Temperature problems were with time stamp and code for missing data in the inderlying SNOTEL data. Temperature data fixed and posted to DMIP 2 web site. Precipitation data for 2003 to 2006 appear to be inconsistent with 1987 to 2002 data. Investigation underway as to cause. We would like to understand the inconsistency before using these data as a basic forcing into which we insert the HMT QPE data. One Hydro group member left to take over River Mechanics group; replacement won't start until Q3.
- Unsure whether to wait for HMT QPE data from winter 2006-2007 before using the data in DMIP 2: must analyze resources at ESRL, OHD, and NSSL.

- Third Hydr-ogroup member transferred to another HSMB group, leaving Mike to write both the DMIP 2 overview and results papers.

3rd Quarter FY08

- HMT radar QPE fields for 2005-2006 found to be deficient. The artifacts are visible at the 1 degree by 1km scale, but not really at the final 4km scale. The radar data needs to be reprocessed before it can be used for DMIP 2 or other HMT evaluations.
- Evaluation of OHD 'basic' gridded gauge-only QPE data being performed by CNRFC. These data were found to be deficient from 2003 onward but may be deficient from 1987 to 2002 as well.

4th Quarter FY08

- John Schaake worked at CNRFC to analyze the 1987-2006 gauge-only QPE grids: found the 2003-2006 period unusable. John developed a new strategy for estimating the obs times for daily stations and will regenerate the gridded time series data. His method was approved by Art Henkel and Rob Hartman.
- OHD Hydromet group found that reprocessed HMT radar QPE fields are still deficient. The OHD Hydromet group is working with ESRL and NSSL to solve the problems.

1st Quarter FY09

- Newly derived gauge-only precipitation grids for 1987-2006 should be finished by Jan. 31, 2009.
- Group discovered small problem with temperature data for a SNOTEL station outside of the North Fork basin boundary. Investigation revealed that the errors are only for a certain few years and that there are no impacts.

2nd Quarter FY09

- Another delay in deriving the QPE for the western basins. However, the work was started and put on a fast track. Another approach was planned as a back up. This second approach uses the Calibration MAP program and MPE.
- Hydro group found a small anomaly in the lumped, uncalibrated simulations for SLOA4; problem is the result of two slightly different parameter sets and is easily resolved.

3rd Quarter FY09

- Evaluation of the revised gauge only QPE data set for the Western Basins showed that the Carson Data are not consistent over time.
- Work on this project and others postponed to focus attention on the analysis of the Red River of the North flooding in March and April of this year. Work resumed in July on DMIP 2.

OHD – NCEP Coordination

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Pedro Restrepo

Objective: Coordinate OHD and NCEP hydrologic modeling efforts

Milestones

Task	Due Date	Status
NCEP assign point of contract for coordination with OHD	Q2	Complete
Develop Detailed Work Plan	Q4	Complete

Accomplishments/Actions

1st Quarter FY08
- N/A

2nd Quarter FY08
- NCEP hired Jairui Dong to provide point of contact for coordination with OHD on NCEP hydrologic modeling activities

3rd Quarter FY08
- Work plan in progress

4th Quarter FY08
- Jiarui finished and presented the work plan. It was reviewed and accepted by OHD.

1st Quarter FY09
1. Work in progress

2nd Quarter FY09
- Jiarui presented the progress report. Work is progressing according to schedule

3rd Quarter FY09
1. Work in progress

Problems Encountered/Issues

1st Quarter FY08 - N/A

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 - None

2nd Quarter FY09 - None

3rd Quarter FY09 – None

Support Distributed Model Implementation

Core Goal: Provide, then improve, gridded water resource data production capability

Management Lead: Mike Smith

Objective: Provide training and support to RFCs as necessary to support implementation for river, flash flood, and new product forecasting.

Milestones

Task	Due Date	Status
16. Provide training and support to RFCs as necessary to support implementation for river, flash flood, and new product forecasting.	Ongoing	
17.		
18.		
19.		

Accomplishments/Actions

1st Quarter FY08
- OHD hosted NERFC personnel for 3 days of hands-on training.

2nd Quarter FY08
- MARFC requested hands-on training for early summer 2009
- At OHD's request, ABRFC modified the XDMS program to display gridded temperature
- OHD provided RFCs with guidance on how to derive channel routing parameters given that USGS event observations are no longer easily available.
- OHRFS spinning up use of HL-RDHM: OHD provided guidance on how to generate soil moisture simulations.
- Victor provided 'filled' Sac parameter grids to NERFC. Shane provided assistance to SERFC for Puerto Rico and the Tar basin. Shane helped John Halquist with Sac parameters for CONUS runs. Shane, Victor, and Naoki helped NERFC noted problems along the coastline with missing Snow-17 values.

3rd Quarter FY
- Per CBRFC request, Victor and Zhengtao developed a channel loss addition to HL-RDHM. This algorithm mimics the CHANLOSS NWSRFS operation.
- Victor and Zhengtao helped OHRFC fix a problem with generating soil moisture fields.
- Hydro group began working with MARFC for training at OHD July 21-24
- Paula Cognitore of MARFC requested the program that converts MAP time series into XMRG grid time series. Zhengtao sent her the code and instructions.

Problems Encountered/Issues

1st Quarter FY08
- **None**

2nd Quarter FY08
- Loss of contractor Shane Sheldon March 31.

3rd Quarter FY09
- An emerging problem is the need for a consistent approach for deriving gridded temperature data.

- The USGS flow measurements that we use for estimating initial channel routing parameters were taken off-line by USGS. USGS has concerns about the validity of the measurements because they are sometimes taken at different points in the channel reach. Users of these data must now request them from USGS offices.

Hydrologic Verification

Improve Ensemble Hindcaster

Core Goal: Verify our forecast and uncertainty information

Management Lead: Julie Demargne

Objective: 1) Use the NWSRFS Hydrologic Ensemble Hindcaster prototype to verify existing ensemble forecasts based on various ensemble preprocessing methodologies for XEFS test basins.
2) Integrate the NWSRFS Hydrologic Ensemble Hindcaster (including single-valued hindcasting) into the R&D XEFS prototype within the CHPS-FEWS environment. This is done via the configuration of customized FEWS workflows for specific forecasting scenarios. This activity depends on the progress made by the RFCs for the migration of their XEFS test basins into CHPS, in order to define the ensemble hindcasting workflows based on the operational deterministic forecasting process.
3) Develop additional capabilities for hindcasting with ensemble postprocessing (i.e., the EnsPost prototype)
4) Develop user's manual for installation and operation of the hindcasting workflows in the R&D XEFS prototype
5) Support the validation of the R&D XEFS components through hindcasting in CHPS and systematic verification with the Ensemble Verification System research prototype; this includes hindcasting scenarios with EPP3 ensemble preprocessor prototype, EnsPost ensemble postprocessor prototype, real-time bias-correction technique, and HMOS prototype and the analysis of the different sources of uncertainty. Publish the verification results for XEFS test basins in a scientific manuscript.

Milestones

Task	Due Date	Status
Use the NWSRFS Hydrologic Ensemble Hindcaster prototype to verify ensemble products from various ensemble preprocessing methodologies	FY09 – Q3	Ongoing
Integrate the NWSRFS Hydrologic Ensemble Hindcaster into R&D XEFS within CHPS-FEWS	FY09 - Q4	Ongoing
Develop hindcasting capabilities with ensemble postprocessing	FY09 - Q4	Ongoing
Develop user's manual for installation and operation of hindcasting workflows in R&D XEFS	FY10 – Q1	
Support the validation of R&D XEFS components with systematic evaluation of existing ensemble products at RFC test basins	FY10 – Q3	

Accomplishments/Actions

1st Quarter FY09

- Participated in various meetings with Deltares and HSEB to discuss the hindcasting requirements and functionalities with FEWS for CHPS and XEFS. Single-valued and ensemble hindcasting capabilities were successfully tested using the current BOC CHPS prototype. The CHPS hindcasting capabilities are planned to be used for assessing the various sets of ensembles from the XEFS components once the test basins are migrated into the CHPS prototype (probably sometimes late spring or early summer).
- Discussed with Allen Bradley (University of Iowa) the current limitations of the ESP hindcasting capability with the reservoir operations; a temporary solution was developed by Allen B. to run the hindcaster prototype for the OHRFC test basins. This solution is not viable for CNRFC due to issues with other ESP operations.

2nd Quarter FY09

- Ran the NWSRFS Hydrologic Ensemble Hindcaster to generate flow ensemble forecasts for CNRFC test basin using the latest EPP3 precipitation ensembles based on QPF values. These ensemble hindcasts will be verified with EVS and presented for a poster on EVS verification for the HEPEX workshop to be held in Toulouse, France, on 15th-18th June, 2009.
- Discussed with HSEB and Deltares the BOC CHPS prototype and its hindcasting capabilities. The BOC CHPS prototype to be released in April 09 will be used to start the definition of hindcasting workflows for R&D XEFS.

3rd Quarter FY09

- Using the CHPS-FEWS prototype from April 09, defined for the NFDC1 test basin in CNRFC, hindcasting workflows with the following components: EPP3, Hydrologic Models, and EnsPost. Discussed with Deltares how to improve the implementation of the hindcasting workflows on other forecast points. The EPP3 hindcasting component might need to be run as a stand alone component for the periods where the GFS and CFS forecast files are not available; for these periods, only the GFS and CFS hindcast files are available in a different file format).
- At the HEPEX workshop (Toulouse, France, 15th-18th June, 2009), presented a poster on the verification results for hindcasts based on the EPP3 precipitation ensembles generated from the GFS ensemble means. This poster included the analysis on the impact of the input uncertainty and the hydrologic uncertainty on streamflow forecast quality.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

3rd Quarter FY09 - None

Develop Verification Strategies

Core Goal: Verify our forecast and uncertainty information

Management Lead: Julie Demargne

Objective:

1) Support the NWS Hydrologic Forecast Verification team and the WR Hydrology Verification team with the RFC verification case studies to develop standardized verification strategies for an effective communication of results to end users. This activity will include:
   - surveying all the RFCs on their current archiving practices and issues;
   - supporting the existing software and prototypes (IVP, EVS, and Ensemble Hindcaster) to run verification case studies;
   - gathering a list of enhancements for the existing software and prototypes to meet all user needs;
   - developing additional training material for the team members;
   - proposing standardized metrics and graphics to present verification results to identified users;
   - proposing performance tracking measures to show the level of success in river forecasting;
   - developing requirements for the NWS Performance Branch to disseminate RFC verification data and results;
   - working on verification case studies to evaluate the proposed verification standards (including baseline forecasts)
2) Organize and conduct a second RFC verification workshop in Fall 08 with the NWS verification team to share verification experiences, present new science and software applications, and develop the final team report on verification strategies.
3) Support the National Verification Focal Point to coordinate the verification activities within NWS, advocate for verification activities (AHPS, HOSIP/OSIP), represent hydrologic verification with respect to National Performance Management Committee (NPMC), contribute to verification policy decisions, coordinate hydrology verification journal articles and training development, and collaborate with academia, Deltares, NCEP, and the HEPEX project participants; this includes to define a HEPEX verification test bed in collaboration with Iowa State University, Environment Canada, Hydro-Québec, ECMWF, to evaluate existing and emerging verification methodologies and software for hydrological forecasting systems.

Milestones

Task	Due Date	Status
Support the WR Hydrology Verification Team	FY08 – Q3	Complete
Support the NWS Hydrologic Verification Team	As necessary	Ongoing
Organize and conduct 2nd RFC verification workshop	FY09 – Q1	Complete
Support the National Verification Focal Point activities	As necessary	Ongoing
Propose standard verification strategies in the NWS Hydrologic Verification Team report	FY09 – Q4	Ongoing
Test the proposed verification standards with verification case studies	FY11 – Q4	

Accomplishments/Actions

1st Quarter FY08

- Worked on planning the verification activities for FY08 with the Verification Core Goal team, in coordination with the XEFS and RFC Archive Core Goal teams. The AHPS verification plan for

FY08 was sent to OHD management on 11/02/2007.

- Organized monthly meetings with the NWS verification team to review the team charter, deliverables and agenda, to determine the current archiving processes and issues at the 13 RFCs, and to select verification case studies for all RFCs. Participated in the meetings with the WR verification team to review CB- and CN-RFCs case studies.
- Participated in the NPMC monthly meetings, as well as the verification workshop in early November; OHD verification activities for both single-valued and ensemble forecast verification were presented.
- Discussed with Matt Kelsch the verification training modules that COMET is developing.

2nd Quarter FY08

- Finalized the AHPS verification plan for FY08 and gave a presentation to the HICs on 01/29/2008.All verification activities got funded at 100%.
- Continued to organize monthly meetings with the NWS verification team to determine the current archiving processes and requirements, to select verification case studies for all RFCs, and to gain expertise with IVP ob8.2 by working on an exercise. Started to organize the second RFC verification workshop for the week of November 18 or the week of December 09. Participated in the meetings with the WR verification team to review the NWRFC case study.
- Set up a new verification listserver called verify-hydro, to facilitate communication on verification with DOHs, OHD, verification teams, and Matt Kelsch at COMET.
- Worked on a BAMS paper entitled “Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service”; the proposal for this paper has been accepted as an In Box paper; sent the paper to the OHD management for review.
- Reviewed and updated a paper entitled “Completing the forecast: assessing and communicating forecast uncertainty” to be published in the ECMWF proceedings.
- Participated in the NPMC monthly meetings; discussed high impact event verification, GIS-based verification applications, and dissemination of verification information to the general public.
- Reviewed the verification training module developed by Matt Kelsch at COMET and discussed the training modifications with Kevin Werner and Holly Hartman.
- Sent training requirements to OCWWS for ensemble forecasting and verification.

3rd Quarter FY08

- Continued to meet with the NWS verification team to discuss the archiving requirements, review verification case studies for CB-, CN-, WG-RFCs, give a demo of EVS, and review exercises with IVP and EVS. Continued to organize the second RFC verification workshop for November 18-20. Participated in the meetings with the WR verification team to review the WFO case study and discuss the final team report.
- Support the verification listserver called verify-hydro, to facilitate communication on verification with DOHs, OHD, verification teams, and Matt Kelsch at COMET.
- Finalized the BAMS paper entitled “Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service”, to be published as an In Box paper; the paper was submitted to AMS on 05/06/2008.
- Participated in the NPMC monthly meetings; continued to discuss GIS-based verification applications and best ways to disseminate verification information to the general public.
- Helped Matt Kelsch at COMET to finalize the verification training module with Kevin Werner and Holly Hartman; the module was made available on 06/01/2008 and was well received by members in the NWS verification team.
- Submitted a verification session proposal for the AGU Fall meeting; the session for which the co-conveners are Allen Bradley, Kristie Franz, Barbara Brown and Julie Demargne, was accepted.

4th Quarter FY08

- Continued to meet with the NWS verification team to review verification case studies for NE-, OH-, MB-RFCs, and review the EVS exercises. Continued to organize the second RFC verification workshop for November 18-20 in Salt Lake City. A draft agenda was sent to the team on 09/23/08.
- Continued to support the verify-hydro listserver.

- Started to revise the BAMS verification paper entitled “Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service”; the revised paper will be submitted to AMS by the end of October 08.
- Continued to participate in the NPMC monthly meetings to discuss verification efforts at the regions, WFOs, NCEP and other agencies.
- Organized the verification session for the AGU Fall meeting with the co-conveners (Allen Bradley, Kristie Franz, Barbara Brown and Julie Demargne); 16 abstracts (including 2 abstracts from the HEP group) were submitted for this session, which will be scheduled as a poster session.
- Worked with Kristie Franz and Mike DeWeese on the verification of recent flood forecasts in NCRFC; an abstract has been submitted for the AGU Fall meeting.
- Started to prepare the AHPS FY09 verification plan with the Verification Planning Team on 09/23; reviewed the verification activities of the Hydrologic Ensemble Prediction (HEP) group on 09/29.

1st Quarter FY09

- Conducted the second RFC Verification Workshop in Salt Lake City on November 18-20. All the workshop material (presentations, exercise, recommendations) is available online on the verification team website (http://www.nws.noaa.gov/oh/rfcdev/projects/rfcHVT_workshop2.html). The evaluation survey showed that the workshop was very well received and should be conducted with this team every two years to discuss the progress on the various verification activities within the NWS and in academia.
- Continued to support the verify-hydro listserver.
- Finalized the BAMS verification paper entitled “Application of Forecast Verification Science to Operational River Forecasting in the U.S. National Weather Service”; the paper is scheduled to be published in the April issue.
- Led the verification poster session for the AGU Fall meeting with the co-conveners (Allen Bradley, Kristie Franz, Barbara Brown and Julie Demargne); 16 posters, including 2 from the OHD/HSMB/HEP group, were presented at this session.
- Finalized the AHPS FY09 verification draft plan with the Verification Planning Team and presented it to the OHD management in November 09.
- Developed the NWS Verification Team interim report to present the data archiving requirements, the 13 RFC verification case studies and the workshop recommendations. This interim report will be finalized by 01/16/09 and sent to the OHD management, the DOHs and the HICs to better coordinate the verification activities within the NWS and help develop the final team report.
- Started to develop standard verification strategies with the NWS verification team. These strategies will be described in the final team report and will need to be tested out with new RFC verification case studies.

2nd Quarter FY09

- Finalized the NWS Verification Team interim report on data archiving requirements, the 13 RFC verification case studies and the workshop recommendations; the report was sent on 01/22/09 to the OHD management, the DOHs and the HICs and is available on the team website at http://www.nws.noaa.gov/oh/rfcdev/docs/NWS-Verification-Team_interim_report_Jan09.pdf
- Met with the NWS Verification Team in February and March to discuss key verification metrics and plots, as well as standard verification strategies (including baseline forecast to evaluate the impact of run-time modifications on the forecast quality). The presentation of the proposed verification standards is available on the team website at http://www.nws.noaa.gov/oh/rfcdev/docs/Standard_verification_strategies_03202009.pdf
- Finished the first version of the NWS Verification Team final report to propose verification standards. On 04/01/09, the report was sent to the team members for a final review and to the OHD management; the report will be finalized by late April. The NWS Verification Team charter will have to be modified to continue the team work to evaluate the proposed verification standards with case studies and support the development of the verification services within CHPS.
- Finalized the FY09 verification project plan and presented it to the HICs and the ARC Committee. At the HIC/ARC meeting, presented a proposal for a standard baseline forecast to

evaluate the impact of run-time modifications on the forecast quality; the proposal will be revised to include the comments from the meeting.

- Continued to support the verify-hydro listserver to answer questions on verification software and case studies.
  - Submitted one abstract for the Fourth International Verification Methods Workshop (Finland, June 2009) to present the progress made to communicate meaningful verification for real-time decision making.
  - Submitted one abstract for the HEPEX workshop (France, June 2009) to present the HEPEX verification test bed.
  - Described the HEPEX verification test bed for the NOAA-Environment Canada MOU agreement; signed the confidentiality agreement with Hydro-Quebec to get the test bed datasets.
  - Participated in the NPMC meetings to discuss sky verification, consistency scores, and forcing input verification (NDFD verification and BOIVerify application).
  - Discussed with COMET the 2 new verification training modules for FY09.
  - Met with NCEP/EMC colleagues to discuss the verification products developed by NCEP and OHD; NCEP agreed to use RFC-defined spatial masks to provide the grid verification results for their forcing input ensembles on 3 different levels of spatial aggregation: by RFCs, by carryover groups, and by forecast groups.

3rd Quarter F09

- Continued to finalize the NWS Verification Team final report to propose verification standards. The report was reviewed by all the team members, as well as Geoff Bonnin and Pedro Restrepo from OHD. The report will be sent to Gary Carter and Tom Graziano by mid-July 09 for their review.
- The verification team met on 05/26/09 and on 06/29/2009 to discuss the recommended verification standards and new case studies. A demonstration of verification displays (spatial maps of verification scores by month and by lead time and display of historical analog information for a real-time forecast) was given using the FEWS Spatial Display and the FEWS Time Series Display using datasets from CNRFC. The same demonstration was given at the CAT Implementation Workshop on 06/26/09 to the CAT RFCs. The feedback was very positive; a few RFCs wanted to get the demo in order to start implementing similar functionality in CHPS or to get additional feedback on the prototype displays from other forecasters and end users.
- Developed a second team charter for working on the future team activities as identified in the final team report; the second team charter will cover FY2010-2011. The main team deliverables would be: 1) a report that describes improved standard verification metrics and products, as well as RFC case studies and HEP case studies using these standards; 2) the prototype capabilities developed at OHD and at the RFCs to produce the standard verification products using IVP, EVS, and the CHPS display capability; 3) a third verification workshop in 2011 to share progress on verification science, software and case studies made in the NWS, other agencies, and academia.
- Presented the team activities, the recommendations on verification standards, and the second team charter at the HIC meeting on 07/10/2009. The HICs will provide feedback on the team charter in August 09.

- Continued to support the verify-hydro listserver to answer questions on verification software and case studies.
  - Presented a poster at the Fourth International Verification Methods Workshop (Finland, June 2009) communicating meaningful verification for real-time decision making. This included one example of analog display for a flood forecast and examples from the WR water supply website.
  - Presented the HEPEX verification test bed at the HEPEX workshop (France, June 2009). Participants interested in this verification test bed wanted to use EVS since they didn't have such an advanced tool for their ensemble verification.
  - Participated in the NPMC meetings to discuss consistency scores, MOS verification and WeatherBug.

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08 – None

3rd Quarter FY08

- For the NWS verification team, we had to postpone two meetings due to the recent flooding in the Mid-West and the overload of work at several RFCs. We plan to review all the RFC case studies before the 2nd RFC verification workshop on Nov. 18-20.

4th Quarter FY08

- For the NWS verification team, we had to postpone meetings to review RFC verification case studies. Four of the case studies for NW-, SE-, AP-, and NC-RFCs will be reviewed at the 2nd RFC verification workshop on Nov. 18.

1st Quarter FY09

- The charter of the NWS verification team will need to be modified to reflect the recommendations made during the workshop. The final team report with standard verification strategies is due by FY09 Q2. The team will need to continue to work on case studies to test theses standards out and to assess the updated/new verification software applications and new science.

2nd Quarter FY09

- The final team report with standard verification strategies will be finalized by late April and the team charter will be updated to evaluate the proposed verification standards with case studies.

3rd Quarter FY09

- The final team report on standard verification strategies will now be finalized by September 30, 2009 to include comments from the OHD management and the OCWWS management. The team report will also include a second team charter to continue to work on verification strategies with new case studies.

Improve Forecast Verification

Core Goal: Verify our forecast and uncertainty information

Management Lead: James Brown

Objective:

1) Improve ensemble verification capabilities by developing new verification techniques, and publishing the results in one or more scientific manuscripts. In particular:
   - ⇒ Develop simple diagnostic verification measures for key attributes of forecast quality, including discrimination.
   - ⇒ Evaluate methods for quantifying the sampling uncertainties of the deterministic and ensemble verification metrics, focusing on those in the EVS (e.g. through confidence intervals).
   - ⇒ Evaluate methods for diagnosing the phase (timing) and amplitude errors in flow forecasts, initially focusing on single-valued flow forecasts, then extending the technique to ensemble forecasts.
   - ⇒ Report on best strategy to combine information in several verification measures as an overall index of ensemble forecast quality.
2) Extend the Ensemble Verification System (EVS) research prototype to include the new verification techniques, together with known feature requirements and ongoing feature requests from OHD scientists and the RFCs. The feature requirements will be listed and prioritized as they become known. Key goals include:
   - ⇒ Provide new verification measures, such as the ROC score and CRPS decomposition.
   - ⇒ Allow for skill calculations with the probabilistic scores relative to climatology (Brier Score and CRPS).
   - ⇒ Publish a manuscript documenting the capabilities of the EVS for an international scientific journal.
   - ⇒ Coordinate the development of the EVS with other stakeholders, including the WR water supply team, the RFCs and with the Thorpex-Hydro project.
3) Support the development of a baseline verification tool for verification of single-valued and ensemble forecasts within the CHPS environment.
   - ⇒ Implement the necessary steps to allow the prototype EVS to run within the FEWS environment using a predefined EVS project file that references forecasts and observations in the PI-XML format and writes outputs to a predefined directory.
   - ⇒ Support HSEB in developing baseline code that is specific to the FEWS implementation of CHPS.
   - ⇒ Support the HSEB in implementing baseline code for a more general verification system (CHPS-VS) for single-valued and ensemble forecasts.
4) Develop the scientific methods necessary to conduct Real-Time Verification (RTV) of ensemble forecasts and develop prototype software for the bias-correction of ensemble forecasts in real time.
   - ⇒ Identify and evaluate criteria for selecting historic analogs to real-time ensemble forecasts.
   - ⇒ Develop prototype displays of real-time verification information (which include historic analogs and summary verification maps) for discussion with the RFCs and others.
   - ⇒ Support HSEB in their development of baseline code for storing and selecting historic analogs to single-valued and real-time ensemble forecasts.
   - ⇒ Develop a prototype software tool for bias-correcting ensemble forecasts in

real-time and implement and evaluate the technique experimentally at an RFC.

⇒ Write a manuscript on the bias-correction technique for publication in an international scientific journal.

5) Collaborate with COMET and other stakeholders to produce appropriate training material on verification science and software applications for both single-valued and ensemble forecasts.

Milestones

Task	Due Date	Status
Enhance the prototype Ensemble Verification System (EVS) and release the enhanced prototype together with documentation	FY09 Q4	Ongoing
Implement the steps necessary to run the EVS prototype within the FEWS environment and evaluate the implementation	FY09 Q4	Ongoing
Develop simple measures of ensemble forecast quality	FY09 Q4	Ongoing
Submit a scientific manuscript on the EVS prototype to an international journal, including a description of any new metrics proposed	FY09 Q4	Ongoing
Support the NWS verification team with their use of the EVS	As necessary	Ongoing
Evaluate methods for quantifying the sampling uncertainties of the verification metrics	FY09 Q4	Ongoing
Evaluate methods for diagnosing timing (phase) and amplitude errors, initially in single-valued forecasts	FY09 Q4	Ongoing
Report on best strategy to combine information from several verification metrics as an overall measure of ensemble forecast quality	FY09 Q4	Ongoing
Develop an experimental prototype for bias-correcting ensemble forecasts in real-time	FY09 Q2	Complete
Implement and evaluate the experimental prototype for bias correcting ensemble forecasts in real-time in collaboration with an RFC	FY09 Q4	Ongoing
Submit a scientific manuscript on the real-time bias correction prototype to an international journal	FY09 Q3	Complete
Develop prototype displays of real-time verification information for discussion with the RFCs and others	FY09 Q3	Complete
Develop scientific methods for real-time verification to select historic analogs and display summary verification maps	FY09 Q4	Ongoing

Accomplishments/Actions

1st Quarter FY09

- Supported the use of EVS by the RFCs and HEP. Provided an overview of EVS and various topics on ensemble verification at the 2nd RFC Verification Workshop at CBRFC in Salt Lake City, UT: 11/18/08-11/20/08. Support was also given to MARFC and ABRFC in conducting their case studies with EVS, which were presented to the Verification Team on 11/10/08.

2nd Quarter FY09

- Finished the first draft of a manuscript on the EVS for submission to the international journal: *Environmental Modelling and Software*. The manuscript provides an overview of the EVS software, the verification metrics available, how to add new metrics and presents several example applications (co-authors Brown, Seo).
- Finished the final draft of a manuscript on the real-time bias correction work, which uses indicator cokriging to estimate the unbiased (conditional) distribution of the forecast variable given the (possibly biased) real-time forecast. The manuscript will be submitted to the

international journal: *Journal of Hydrometeorology* (co-authors Brown, Demargne, Liu, Seo).

- Started implementing the next major set of updates to the EVS software, which include:
  - The addition of skill calculations for the Brier Score and CRPS with the climatological probability forecast as the reference forecast;
  - The improvement of the aggregation procedure in the EVS for multiple forecast points;
  - The production of several R scripts for reading the numerical outputs from the EVS (in XML format) and writing high quality graphics in EPS format for journal publications;
  - The addition of several new metrics and improvements to existing metrics, including the CRPS decomposition and the ROC Score;
  - Improved documentation with examples.
- Defined the prototype displays of real-time verification information to be presented at the CAT workshop (scheduled for June 09); these prototype displays include verification summary maps for one metric (e.g., RMSE skill score) on various forecast points and analog displays using pre-defined historical events of interest. Started to discuss the data requirements with AB- and CN-RFCs.
- Developed one abstract for the Fourth International Verification Methods Workshop to be held in Helsinki, Finland, on 4th-10th June, 2009. The abstract presents the EVS verification prototype.
- Developed 2 abstracts for the HEPEX workshop to be held in Toulouse, France, on 15th-18th June, 2009. The abstracts present the non-parametric bias-correction method developed for real-time verification and the EVS results for EPP3 forcing input ensembles and corresponding flow.

3rd Quarter FY09

- Completed the manuscript on real-time bias correction of ensemble forecasts, which uses indicator cokriging to estimate the unbiased (conditional) distribution of the forecast variable given the (possibly biased) real-time forecast. The manuscript has been submitted to the international journal: *Journal of Hydrometeorology* (co-authors Brown and Seo).
- Finished the final draft of a manuscript on the EVS for submission to the international journal, including comments from internal reviews: *Environmental Modelling and Software*. The manuscript provides an overview of the EVS software, the verification metrics available, how to add new metrics and presents several example applications (co-authors Brown, Demargne, Liu, Seo).
- Continued implementing several updates to the EVS in preparation for the next release in FY09 Q4. The completed updates include:
  - Brier Skill Score and the Continuous Ranked Probability Skill Score for an arbitrary reference forecast (to be selected by the user).
  - Implementation of a (possibly weighted) average of the verification metrics from several forecast points.
- Attended the Fourth International Verification Methods Workshop in Helsinki, Finland, on 4th-10th June, 2009. The EVS was presented to the conference participants and a poster was delivered on the communication of verification information with in the NWS.
- Developed and presented several prototype displays of real-time verification information to the CAT workshop on 26th June 2009. These prototype displays include verification summary maps for simple metrics (e.g., RMSE skill score) and analog displays using pre-defined historical events of interest and they are based on the FEWS display capability.
- Implemented and completed initial testing of the EVS within CHPS, including the development of a FEWS adapter for the EVS. The connection was demonstrated to the HSMB group leaders and others on 26th May 2009.
- Conducted initial testing of the Cross-Wavelet-Transform (XWT) as a means of separating phase (timing) and amplitude errors in single-valued hydrologic forecasts. Held a HEP group seminar on 1st June to discuss the technique's potential.
- Developed automatic methods (based on numerical differentiation using wavelet analysis) to identify individual hydrologic events in the forecasts and observations for forecast verification purposes (in particular, to analyze the timing/shape errors using STAT-Q)

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

3rd Quarter FY09 - None

Logistical Verification

Core Goal: Verify our forecast and uncertainty information

Management Lead: Mary Mullusky

Objective: Compute, display, and disseminate forecast services logistical measures information. Develop a plan to compute remaining logistical measures

Milestones

Task	Due Date	Status
1. Support of RFC verification focal points to populate the database	Q4	ongoing
2. Report of common forecast services metric queries	Q2	delayed
3. Display prototype maps of point forecast services	Q4	delayed
4. Experimental web pages of forecast services	Q4	delayed
5. Develop a plan to compute remaining logistical measures	Q4	delayed

Accomplishments/Actions

1st Quarter FY08

- Created a new policy, to require RFCs to populate and maintain the hydrologic forecast services tables in the IHFS database. The services information will be consolidated with the localized river location information required from the Weather Forecast Offices (see NWSI 10-924, Weather Forecast Office Hydrologic Reporting, http://www.weather.gov/directives/sym/pd01009024curr.pdf) in the National River Location Database. The new policy 10-914 *River Forecast Center Hydrologic Services Information,* was distributed to the regions in December with comments due Friday, January 11, 2008. Comments to be integrated in Q2.

2nd Quarter FY08

- No activity. Regional comments integration into Policy 10-914 delayed until April. This will impact our ability to require RFCs to populate the services database.

3rd Quarter FY08

- No activity. Regional comments integration into Policy 10-914 delayed until August. This will impact our ability to require RFCs to populate the services database.

4th Quarter FY08

- No activity. Regional comments integration into Policy 10-914 delayed until December. This will impact our ability to require RFCs to populate the services database.

1st Quarter FY09

- No activity. Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

2nd Quarter FY09

- No activity. Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

3rd Quarter FY09

- No activity. Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY08

- Regional comments integration into Policy 10-914 delayed until April. This will impact our ability to require RFCs to populate the services database.

3rd Quarter FY08

- Regional comments integration into Policy 10-914 delayed until August. This will impact our ability to require RFCs to populate the services database.

4th Quarter FY08

- Regional comments integration into Policy 10-914 delayed until December. This will impact our ability to require RFCs to populate the services database.

1st Quarter FY09

- Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

2nd Quarter FY09

- Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

3rd Quarter FY09

- Regional comments integration into Policy 10-914 delayed. This will impact our ability to require RFCs to populate the services database.

Inundation Mapping

Static Flood Inundation Maps Web-Page Development and Deployment

Core Goal: Improve Flood forecast Inundation Maps – Static Maps

Management Lead: Victor Hom

Objectives:
1) Develop AHPS web page interface,
2) Deploy flood inundation maps in a nationally consistent, scientifically sound, and objective manner, and
3) Implement program elements to assure quality deliverables and maintenance of viability.

Team Members:
Brian Astifan – Eastern Region
Frank Bell – Southern Region
Brent Bower – Western Region
Laurie Hogan – Eastern Region
Victor Hom – Office of Climate Water and Weather Services / HSD
Kris Lander – Central Region
Doug Marcy – National Ocean Service / Coastal Services Center
Seann Reed – Office of Hydrologic Development / HSMB
Wendy Pearson – Central Region

I. Task Areas

Tasks	Responsible Organization
1. Regional Flood Mapping	NOAA NWS, NOAA NOS CSC, FEMA, USGS, USACE, and local Partners
2. Flood Mapping Training	NOAA NWS, NOAA NOS CSC
3. Program Policy and Strategic Planning	NOAA NWS, NOAA NOS CSC, Federal Partners
4. Web Evolution	NOAA NWS, NOAA NOS CSC
5. Maintenance/Servicing Maps	NOAA NWS, NOAA NOS CSC

II. Milestones

Task Area #1 - Regional Flood Mapping		
Subtask 1-1 Southern Region's Gulf Coast Libraries (FIM08-1P)	**Due Date**	**Status**
Implemented 4 map libraries for locations in Texas, 5th library moved to 9/08	May 2008	Completed
Implemented total of 17 map libraries in FY08 for Southern region Gulf Coast Area courtesy of Hurricane Katrina Supplemental Funding.	Sep 2008	Completed
Implement up to 5 Flood Inundation Map Libraries	Jun 2009	In-progress Moved from Mar/2009
Implement up to 9 remaining libraries Flood Inundation Map Libraries	Sep 2009	In-progress
Subtask 1-2 Southern Region's Lower Colorado River Flood Libraries (FIM08-3P)	**Due Date**	**Status**
Implemented 3 libraries for Texas sites in the Lower Colorado Basin	Sep 2008	Completed
Implement up to 5 libraries in Texas (4 in the Lower Colorado and cross transfer WGRFC/LCRA technique to 1library for the San Antonio River)	Jun 2009	In-progress Moved from April 2009
Subtask 1-3 Eastern Region's Susquehanna River Flood Libraries (FIM08-4P)	**Due Date**	**Status**
Implement 3 libraries for Upper Susquehanna River Basin	Sep 2009	In-progress

Implement up to 6 libraries in the Upper, Mid, and Lower Susquehanna River Basin	Sep 2010	In-progress
Subtask 1-4 Eastern Region's Delaware River Flood Libraries (FIM09-1P)	**Due Date**	**Status**
Implement up to 7 libraries for Delaware River Basin	Sep 2009	In-progress
Subtask 1-5 Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P)	**Due Date**	**Status**
Implement up to 2 libraries	Sep 2009	In-progress Delayed Start due to delayed funding.
Implement up to 8 libraries	Mar 2010	In-progress Delayed Start du e to delayed funding, schedule will be revised in Q4
Implement up to 10 libraries	Sep 2010	In-progress Delayed Start du e to delayed funding, schedule will be revised in Q4
Subtask 1-6 Eastern Region's Ohio Flood Libraries (FIM09-3P)	**Due Date**	**Status**
Implement up to 2 libraries in WFO Cleveland HSA	Sep 2009	1 library was implemented in April 2009, 2nd library In-progress
Subtask 1-7 Eastern Region's North Carolina Libraries (FIM07-1P)	**Due Date**	**Status**
Implemented 16 map libraries for sites in North Carolina	Sep 2007	Completed
Implement map library for Tar River at Rocky Mount NC	Jun 2009	In-progress, Moved from 2/2008, Map Review Completed, Need to address Mapping issues.
Map Maintenance and improvements for Tar River Libraries	Jun 2009	In-progress, Moved from 2/2008, Map Review Completed, need to address Mapping issues.

Task Area #2 - Flood Mapping Training		
Subtask 2-1 Develop and BetaTest Goto Training (FIM08-8P)	**Due Date**	**Status**
Overview of Flood Mapping Process	Mar 2009	Completed
CSC Contractor's Report on QC/QA (work was partially funded via FY08 subtask FIM08-6P)	Aug 2009	In-progress, Moved from 6/2008 Contractor addressing NWS filed review comments.
AHPS Contractor's Report on Depth Grid processing (work was partially funded via FY08 subtask FIM08-8P)	Jun 2009	In-progress
Flood Mapping: Hydraulics and Hydrology	Jul 2009	In-progress
Flood Mapping: GIS Analyses	Aug 2009	In-progress
Quality Assurance and Checking: Stage 1	Oct 2009	In-progress
Quality Assurance and Checking: Stage 2	Nov 2009	In-progress
Training Module Development	Dec 2009	Funding Approved, In progress.
Subtask 2-2 Develop Formal Residence Training and Hands-On Workshop (FIM09-4P)	**Due Date**	**Status**
NOAA NOS CSC/OCWWS HSD Perform Dry-Run of Residence Course at CSC Training Center	Nov 2009	In-progress
NOAA NOS CSC/OCWWS HSD Training Center Deliverable	Jan 2010	In-progress, Need to find alternative funding resource, since this was not funded via FY10 NEST. Subject to FY10 funds for regional QAQC board and participants

NOTE: The task area #2 is an enhancement to FIM08-8P, previously titled "Develop Training". FY09 goals are to provide more detailed Training in different media formats, capture new QAQC goals in the AHPS Flood Mapping Process, and develop hands-on-workshop for the Regional Flood Mapping QC board.

Task Area #3 – Program Policy and Strategic Planning		
Subtask 3-1 Federal Guidelines and Statement of Work Templates (FIM08-2P)	**Due Date**	**Status**
Completed Guidelines Version 2.0	Jun 2008	Completed
Completed SOW Version 1.0 templates for H&H/GIS and AHPS Implementation (previous subtask FIM08-5P)	Jun 2008	Completed
Draft Guidelines Version 3.0	Jun 2009	In-progress
Draft SOW Version 2.0 templates for H&H/GIS and AHPS Implementation	Jun 2009	In-progress
Draft Guidelines Version 4.0 for ACWI Review	Jun 2010	On Hold
Draft SOW Version 3.0 templates for H&H/GIS and AHPS Implementation	Jun 2010	On Hold
Subtask 3-2 Evaluate the Need for Real-time vs. Static Inundation Mapping at NWS Forecast Points (FIM08-7P)	**Due Date**	**Status**
Preliminary Analysis, Development HOSIP SON, HOSIP Plan (work was partially funded via FY08 subtask FIM08-7P and HSMB Labor Funds).	Sep 2008	Completed
HOSIP Research and Analysis Phase 1 – Research and Collect Basic Data	Jun 2009	On Hold
HOSIP Research and Analysis Phase 1 - Validate hydraulic indices with detailed case studies	Dec 2009	On Hold
HOSIP Research and Analysis Phase 2 - Compute hydraulic indices and rate the need for real-time mapping at all NWS forecast points	Sep 2010	On Hold
Subtask 3-3 Western Region Flood Mapping Scoping and Planning for Partnered Candidates (FIM09-5P) (~FIM08-9P)	**Due Date**	**Status**
Present at NHWC about Flood Maps and Risk Mapping to Western partners, Meet with NHWC and Stakeholders.	May 2009	Completed
Scope and plan for FY10-FY11 AHPS Flood Inundation Map Libraries with Western Region.	Sep 2009	In-progress
Subtask 3-4 Better Leverage with Risk Mapping Partnerships (FIM09-6P) (~FIM08-9P)	**Due Date**	**Status**
The objectives of this deliverable were to document Incentives (e.g. CRS Credits, StormReady, etc) and plan to develop Partnership Programs for Future AHPS Flood Mapping Sites.	June 2010	On-hold due to funding
Subtask 3-5 Program Management Support (FIM09-7P)	**Due Date**	**Status**
Develop conceptual linkage of Inundation Libraries to AHPS Probability Forecasts - (FIM08-10P)	Jul 2008	Completed -See Aptima Report
The objectives of this deliverable were (a) to develop a Long Term Plan based on Lessons Learned and Partnered Activities to ensure continuity and consistency in AHPS Flood Maps and (b) to provide governing principles to maintain the plan and assistance where necessary for OCWWS/OHD such as creation/maintenance of the AHPS Flood Mapping Toolkit, refreshing of OCWWS intranet Flood Mapping webpage, document management tracking of Federal Guidelines, and further enhancements/expansion of SOWs to meet the various partnership needs.	June 2010	On-hold due to funding

NOTE: Subtask 3-1 is dependent on in-kind support, therefore time delivery schedule is subjected to change. Subtasks 3-2, 3-4, and 3-5 are on-hold due to funding.

Task Area #4 – Web Evolution		
Subtask 4-1 AHPS Web Portal Updates (FIM09-8P)	**Due Date**	**Status**
Evaluate and Prioritize Changes to AHPS Portal for Flood Mapping.	Mar 2009	On Hold
Work with Contractor on Project Scope	Apr 2009	On Hold
Contractor Delivers FY09 AHPS Web Changes	Sep 2009	On Hold
Subtask 4-2 Google Map (FIM09-9P)	**Due Date**	**Status**
The objectives of this deliverable were to evaluate AHPS Flood Inundation Mapping and identify features that could be more effectively and efficiently implemented and rendered on Google.	June 2010	On-hold due to funding
Subtask 4-3 Prior Web Enhancements	**Due Date**	**Status**
Enhance AHPS Inundation Zoom Features (work was partially funded via FY08 subtask FIM08-5P)	Jun 2009	In-progress Delayed due to AHPS prioritization, Moved from 12/08

Task Area #5 – Maintenance/Servicing Maps		
Subtask 5-1 Maintain AHPS Flood Maps (FIM09-10P)	**Due Date**	**Status**
The objectives of this deliverable were to evaluate, program, and fix Flood Maps for drastic changes to Flood Categories, land-use, infrastructure, and base maps which will render existing maps to be ineffective.	Sep 2010	On-hold due to funding

III. Accomplishments/Actions

FY2009

1st Quarter FY09

Develop North Carolina Libraries - (FIM07-1P)

- OCWWS provided QAQC training to Eastern Region and SERFC and communicated expectations on the review of the new Tar River at Rocky Mount NC map and four other revised maps for the Tar Basin.

Develop Training - (FIM08-8P)

- Eastern Region helped identified the need for Training in Stage 1 QAQC. As a result, NOAA/NOS/CSC provided a goto meeting to demonstrate some expected outcomes from Stage I QAQC. NOAA/NWS/OCWWS provided GoTo training on Stage II.
- OCWWS HSD provided two teletraining sessions one for CR and another for WR staff on 1) Overview of the technical aspects of the map development process; 2) Overview of the NWS inundation mapping program/goals; and 3) Advice on outreach and development of inundation mapping partnerships.

Develop linkage of Inundation Libraries to AHPS Probability Forecasts - (FIM08-10P)

- OCWWS provided FEMA officials an overview of the Aptima Report which provided a conceptual web interface showing inundation maps and risk/loss estimation tools in association with AHPS Probability Forecasts and hydrographs at FEMA stakeholder's meeting.
- OCWWS provided USGS officials an overview of the Aptima Report which provided a conceptual web interface showing inundation maps and risk/loss estimation tools in association with AHPS Probability Forecasts and hydrographs at NOAA-USGS quarterly meeting.

2nd Quarter FY09

Develop North Carolina Libraries - (FIM07-1P)

- NWS field offices reviewed the revised Tar River flood maps. HSD is coordinating the review and working to collectively address comments.

Southern Region's – Gulf Coast Flood Libraries (FIM08-3P)

- AHPS H&H/Geospatial Contractor is completing resubmission of 5 Flood Map Libraries: White Oak Bayou - Houston, TX (HGTT2); Black Warrior River - Tuscaloosa, AL (TODA1); Vermillion River - Lafayette, LA (VLS1); Clear Fork Trinity River - Weatherford, TX (WEAT2); Tickfaw River - Holden, LA (HOLL1). There are a total of nine libraries under Phase II, where hydrologic, hydraulic, and geospatial analyses are being performed.

Southern Region's – Lower Colorado River Flood Libraries (FIM08-3P)

- WGRFC provided additional flood inundation maps to be implemented onto AHPS. The deliverables were to Orion for flooding beyond the 1% Annual Chance Flood and supplements the other inundation polygon shapefiles for Colorado at Bay City Texas (BACT2). NOAA coordinated with Watershed Concepts on the H&H/Geospatial Analyses for San Antonio River at Goliad TX (GLIT2), approved the Stage 1 QC, and forwarded deliverables to Phase III AHPS Implementation.

Eastern Region's Delaware River Flood Libraries - (FIM09-1P)

- ER HSD is working with ER WFOs on Quality Assurance of Delaware River Basin Commission flood map deliverables. The project is in phase 2 of the Flood Mapping Process and the field offices are poised to work on several flood map libraries and perform stage 2 QC of phase 3 of the Flood Mapping Process in FY09Q3

Eastern Region's Susquehanna River Flood Libraries (FIM08-4P)

- NOAA CSC and OCWWS HSD reviewed SRBC contractor's methodology to develop flood depth rasters. This new deliverable was suggested because of the systematic approach and precision in the creation of flood depth values. The net result should be improved deliverables and better assurance of quality. OCWWS HSD and ER are working on getting funds to use this new delivery method and process them into AHPS.

Eastern Region's - Ohio Flood Libraries (FIM09-3P)

- WFO CLE is working on delivering AHPS Flood Maps for the Blanchard River at Findlay Ohio (FDYO1) and Killbuck Creek in Killbuck OH (KILO1). OCWWS HSD provided comments about the Findlay project, which is in Phase 3 and likely deployed in early part of Q3 to AHPS.

Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P))

- OCWWS HSD presented at USGS Midwest Area Leadership Training and provide USGS Midwest and Eastern Water Science Centers a perspective of NWS AHPS Flood Inundation Mapping efforts. Specifics were discussed about the Indiana partnership. In addition, NWS, USGS, and the Polis Center will be working to tie the mapping information to FEMA's HAZUS tool and Google Earth. USGS will also be evaluating the potentials for extending 2D models to build dynamic maps. FEMA region V was also represented.

Develop and BetaTest Goto Training - (FIM08-8P)

- CSC and OCWWS provided 1.5 day training specific to QC Stage I checking of the shapefile product deliverables from Hydrologic, Hydraulic, and Geospatial Analyses at NOAA CSC Training facilities in Charleston, SC. This was in response to ER needs, as identified in their work with the DRBC, and the need to stand-up regional boards to assist in Stage I QC. ER and CR staff provided valuable comments in the formulation of the course. .

Develop Formal Residence Training and Hands-On Workshop (FIM09-4P)

- CSC and OCWWS met and drafted a course outline, course schedule, and course development/milestone plans for the hands-on-work shop to be fielded by the regional QC flood mapping board.

3rd Quarter FY09

Southern Region's – Gulf Coast Flood Libraries (FIM08-3P)

- NOAA CSC approved the AHPS H&H/Geospatial Contractor deliverables of 6 Flood Map Libraries: White Oak Bayou - Houston, TX (HGTT2); Black Warrior River - Tuscaloosa, AL

(TODA1); Vermillion River - Lafayette, LA (VLSL1); Clear Fork Trinity River - Weatherford, TX (WEAT2); Tickfaw River- Holden, LA (HOLL1); Cibolo Creek – Selma, TX (SELT2); and San Antonio River – Goliad, TX (GLIT2). These sites have been transferred to Phase III of the AHPS implementation. The AHPS H&H/Geospatial Contractor is working on another set of six deliverables under Phase II, where hydrologic, hydraulic, and geospatial analyses are being performed.

Southern Region's – Lower Colorado River Flood Libraries (FIM08-3P)

- WGRFC coordinated the review process and has approved three Flood Map Libraries for AHPS implementation in FY09 Q4. These include Texas locations along the Colorado River within LaGrange (LGRT2), Wharton (WHAT2), and Bay City (BACT2).

Eastern Region's Delaware River Flood Libraries - (FIM09-1P)

- ER HSD coordinated and submitted QC comments for USACE considerations. In particular, Eastern Region HSD worked with the USACE to better account for bridges and over-ramps. USACE has made these improvements on the flood mapping deliverables. USACE is working with ER to address other comments.

Eastern Region's Susquehanna River Flood Libraries (FIM08-4P)

- OCWWS HSD and NOAA CSC had in-depth discussions with SRBC and SRBC Flood Mapping contractor concerning improvements to AHPS Flood Mapping and benefits of developing toolkits to assist in the complicated process of flood mapping. OCWWS HSD and NOAA CSC participated in SRBC presentations, which explained the benefits of AHPS and flood mapping. It was agreed upon that the flood mapping community need to better address flood depth grids in regards to tin conversions to raster.
- Eastern Region has performed QC for the Greene, NY inundation library. The methodology for bridge clipping has been passed to the SRBC. The QC comments are currently being reviewed by SRBC and their contractor

Eastern Region's - Ohio Flood Libraries (FIM09-3P)

- AHPS Flood Maps for the Blanchard River at Findlay Ohio (FDYO1) was implemented in April 2009. WFO CLE also provided comments and lessons learned about the AHPS Flood Mapping Process. WFO CLE is working on delivering Killbuck Creek in Killbuck OH (KILO1).

Western Region's Flood Mapping Scoping and Planning for Partnered Candidates (FIM09-5P) (~FIM08-9P)

- OCWWS HSD provided Goto Meeting for Western Region on the AHPS Flood Mapping Program and Process. OCWWS HSD also made presentations at NHWC and ASFPM, so that other partners and consultants are more aware of the opportunities for partnering with NWS. OCWWS and Western HSD discussed mapping opportunities with USGS Washington Regional Science Center and is also looking into mapping opportunities in Idaho and Pacific Northwest with the assistance of WFOs (BOI and SEW).

Program Management Support (FIM09-7P)

- OCWWS HSD promoted the positive relationship and provided FEMA insight on how Aptima's work could be beneficial to FEMA's RISK MAP (Mapping Assessment Plannning). This was delivered via a NOAA-USGS technical workshop at 2009 National Flood Conference, collaborative NOAA-FEMA meeting at the 2009 National ASFPM Conference.

IV. Problems Encountered/Issues

FY2009

1st Quarter FY09

Develop Training - (FIM08-8P)

- AHPS Core Goals team has identified that detailed training is needed to ensure a consistent National program across the regions and assure success with regional partners. The training

should describe in detail the procedures from Phase I to Phase IV of the Flood Mapping Process in an integrated coherent fashion. Although the adhoc goto sessions have been helpful, they do not provide hands-on experience for the partnership to conduct various project tasks with tools normally available for this type of effort. Additional training for the following is subject to FY09/FY10 funding: Flood Mapping: Hydraulics and Hydrology, GIS Analysis, Stage 1 & Stage 2 Quality Assurance and Checking, and Maintenance.

2nd Quarter FY09

Develop Gulf Coast Libraries - (FIM08-1P)

- Due to insufficient mapping and modeling resources, NWS and CSC are working with Watershed Concepts to seek alternative sites in the Gulf Coast region. Since there is limited new detailed FEMA Flood Insurance Studies with sufficient topographic data at NWS AHPS forecast points in Alabama, Mississippi, and Louisiana, mapping efforts will need to focus more in Texas. As a compromised, NOAA CSC will secure H&H Models and Shapefile outputs for Western North Carolina sites in the French Broad Watershed (BLTN7, BIRN7, TKSN7, CTPN7) are being considered for future map developments.
- The five proposed libraries: Guadalupe River near Bloomington, TX (DUPT2), Guadalupe River at Victoria TX (VICT2), Brazos River near Rosharon TX (ROST2), Pine Island Bayou near Sour Lake, TX (SOLT2), Aldridge Creek at Sherwood Dr Huntsville, AL(SHEA1) are awaiting detail mapping and data for H&H modeling.

Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P))

- NWS/USGS/Polis Center cannot start work until State of Indiana receives funding from FEMA.

3rd Quarter FY09

Develop North Carolina Libraries - (FIM07-1P)

- HSD have collected the review comments and will prioritize actions to get these map libraries fixed with other flood mapping and AHPS priorities in Q4.

Southern Region's – Lower Colorado River Flood Libraries (FIM08-3P)

- WGRFC provided additional information on flood inundation shapefiles per request by the customers and WFOs. The additional information shows additional impact areas on the Colorado River at Bay City, Texas. The resubmissions have resulted in delays, but have been made to improve service.

Central Region's Upper Midwest Flood Libraries – Indiana (FIM09-2P)

- The project sponsor, State of Indiana, had schedule conflicts in Q2 and was not able to complete the final FEMA application until June 2009 As a result, there was a delay in the project start date, which will need for revision on the deliverables.

Inputs and Forcings

Prototyping NMQ for FFMP

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: Ken Howard and Jian Zhang, NSSL; Mary Mullusky and David Kitzmiller, NWS

Objective: To test a high resolution Cartesian based regional multisensor QPE and QPF as input into FFMP and to facilitate a NCEP implementation of NMQ system for the national creation of QPI products and prototype dissemination to individual RFCs and weather forecast offices. The following project builds upon the FY05 NMQ to FFMP demonstration project and a FAA sponsored project for the implementation of the NMQ 3-D reflectivity mosaic code set within NCEP operational environment. Through an NCEP implementation, the full NMQ product suite can be prototyped and enhanced for potential utilization within RFC operations as well as within WFOs in FFMP.

Milestones FY08

Task	Due Date	Status
Customization of NMQ Q2 product real time dissemination per RFC domain	December 1, 2008	Completed
Infusion of Canadian and TDWR radar data as available into NMQ NCEP QPI grids	April 1,2008	Completed for NMQ system
National prototype 2.5 minute update cycle for NMQ and QPE products	July 1, 2008	Beginning in Q3 FY09
Initial development and testing of a multi sensor 'best of the science' QPE product	August 30, 2008	Planned
Development strategies and testing protocols for Dual polarization data in Q2	September 20, 2008	Planned

Milestones FY09

Task	Due Date	Status
Customization of NMQ Q2 product real time dissemination per RFC domain	Continuous	Completed
Evaluation and testing of VPR corrected QPE using case studies	May 1,2009	Planned
Complete hardware and software design/configuration for national NMQ implementation	July 1, 2009	Planned
Assessment of Q2 performance in collaboration with RFC	August 30, 2009	Planned
Implementation of new PERSIANN satellite rainfall estimation algorithm in NMQ/Q2	September 20, 2009	Planned

Accomplishments/Actions

1st Quarter FY08

- Completed scripts and communication protocol for providing River Forecast Centers with real time Q2 products.
- Completed code and configuration changes to ingest real time high resolution 88D L2 for NMQ and Q2 products.

2nd Quarter FY08

- Providing, in real time, Q2 product suite to the following RFCs - ARBRFC, WGRFC, CBRFC, and ORFC.

- Continued interactions with RFC staff on Q2 product strengths and weakness. Feedback from RFCs continues to be favorable towards improved coverage, continuity, and quality of Q2 QPE products for potential use in operations.
- Revised several thresholds and system parameters for the tropical precipitation identification. System updates can viewed at http://docs.google.com/View?docid=dcf7xh8d_31gkwgqj54

3rd Quarter FY08

- Established new NMQ/Q2 server and website – nmq.ou.edu
- Documentation for establishing the NMQ systems as a stand-alone operational system has been provide to NCEP and OHD. The documentation included hardware specifications, software and system configuration.
- With the assistance of the Salt River Project and the PHX FO, Q2 products are being made available to 4 forecast offices for use in FFMPA. An evaluation protocol will be established to receive feedback from individual offices in Q4.
- Canadian radar 3D mosaics are being generated in real –time every 5-munites at 1x1km resolution within the NMQ system. Product grids containing the Canadian radar data will be made available in Q4.

4th Quarter FY08

- Updated NMQ and Q2 QPE products grids to encompass 33 Canadian radars. The products are available in digital form and viewable on the NMQ website – nmq.ou.edu.
- Testing is currently underway for hardware and software configurations required for 2.5-minute update cycle for the NMQ products.
- A detailed assessment of Q2 performance during calendar year 2008 has been completed and made available to OHD in PowerPoint form.
- Q2 products were made available in real time to the Phoenix forecast office as an input into FFMPA beginning July 15 to current. Evaluation is ongoing.

1st Quarter FY09

- N/A

2nd Quarter FY09

- Q2 QPE products produced during the 2008 PUFFS project are being validated as input for FFMPA. 8 FF events are being analyzed and compared to Stage 2 MS in collaboration with the Phoenix forecast office.
- Testing and evaluation of a VPR corrected QPE algorithm has been completed on 14 cases. A VPR corrected Q2 QPE product will be implemented in real time CONUS in FY09 Q3.
- Q2 QPE products are currently being disseminated in real-time to 7 RFCs in addition to NOHRSC in FY09 Q2.
- Activities and discussions continue with OHD and NCEP regarding documentation of NMQ/Q2 hardware and software specs, configuration, and costs for a NCEP implementation

3rd Quarter FY09

- N/A

Problems Encountered/Issues

1st Quarter FY08 - None

2nd Quarter FY08

- The NMQ verification system moved to University of Oklahoma computing infrastructure.

3rd Quarter FY08

- A major effort was expended during this period to address issues related to ingest and qc of super_res base level data. New QC applications for super_res are currently being evaluated.
- 14 -dual processors HP servers were procured and will be added to the NMQ level 2 processing server farm. The additional servers will facilitate an increased in temporal and spatial resolution

of NMQ products starting in Q4.

4th Quarter FY08

- The super_res base level data was found to be extremely noise and required significant investigation in to mitigating the noise in base QC as well as impacts on VPRs. Initial changes were made in the QC code, which were not effective and introduced a low bias in Q2 QPEs with tropical events in June, July and August. Techniques are being reassessed, modified and tested to mitigate the impacts of super_res on QPE products.

1st Quarter FY09 - None

2nd Quarter FY09 – None

3rd Quarter FY09

- N/A

Quantitative Precipitation Estimate Evaluation for CI-FLOW

Core Goal: Improve the quality of physical inputs and forcings

Management Leads: David Kitzmiller, OHD and Suzanne VanCooten, NSSL/OAR

Objective: Evaluate significant precipitation event(s) over the Tar River basin (North Carolina) to identify an optimum set of techniques as an initial step towards a state-of-the-science NOAA multi-sensor *quantitative precipitation information* (QPI) for NWS operations. The evaluation will include an assessment of OHD, NSSL and NEDSIS QPI algorithm components towards to determining strengths as well as areas requiring collaborative research and development. Evaluations will include comparisons with independent rain gauge data, operational stage 4 products, *and impact tests on hydrologic simulations*.

Milestones

Task	Due Date	Status
Create multisensor gridded precipitation analyses for the cool-season event 10 December 2004 – 15 January 2005	May 4, 2007	Complete
Assess the performance of various QPI components towards the overall performance of gridded precipitation estimates	June 30, 2007	Complete
Complete radar-gauge multisensor analyses for Dec 2004-Jan 2005 cool season case, run RDHM hydrologic simulations, report on results	June 30, 2008	Complete
Collect and quality control all necessary rain gauge data for Sep 2003 and Jun 2006 warm season cases	June 30, 2008	Complete
Create radar-gauge multisensor analyses for Sep 2003 and Jun 2006 warm season cases, run RDHM hydrologic simulations	Aug 31, 2008	Complete
Compile and document components from each QPI algorithm that, based on the assessment, would contribute towards an optimum MSQPE solution for NWS operations	Sep 30, 2008	Slip to FY09 Q4
Report on the evaluation and develop collaborative research strategy (draft preprint for AMS Hydrology Conference; draft journal article)	Dec 31, 2008	Completed Conference Presentation; Journal Article Draft- FY09 Q4

Accomplishments/Actions

1st Quarter FY07

- OHD – created basic radar input to MPE and High-Resolution Precipitation (HPE, formerly EMPE) for remaining test events
- NSSL – prepared reference data sets for computing various QPI grid fields
- Limited activity due to lack of funding.

2nd Quarter FY07

- NSSL- Assembled data sets of rain gauge observations collected under the radar umbrellas of KAKQ, KRDX, and KMHX for a period encompassing November 1, 2004 to February 28, 2005. NWS HADS provides the rain gauge data within the radar umbrellas but outside the Tar Basin itself.
  15 minute precipitation data from 38 USGS precipitation sites, AWOS locations
  1 Hour precipitation data from USGS, RAWS sites, North Carolina Econet, ASOS and AWOS
  24 Hour reports from NWS COOP observers
- NSSL, OHD, NCDC – Performed QA/QC on data set to document erroneous reports and questionable values
- NSSL - Coordinating FTP site and access criteria for all research partners to access one common rain gauge data set with accompanying documentation on possible erroneous values

discovered from QA/QC procedures
- OHD – established necessary raingauge and radar databases for running MPE and HPE, began test runs with cool season case

3rd Quarter FY07
- OHD – Created one set of MPE (4-km) and HPE (1-km) hourly gridded analyses for periods with precipitation during the December-January 2004-05 period. Carried out initial evaluation, indicating a few suspect hourly gauge values were still in the dataset; then reran the analyses. Overall performance of the precipitation algorithms is as expected for a winter situation – most information in the precipitation grids appears to come from gauge input.
- OHD – made arrangements for running hydrologic model HL-RDHM with precipitation input
- NSSL, NCDC, OHD – agreed to rerun the MPE/HPE, and run Q2 algorithms, using ASOS gauge reports not included in the original analysis.

4th Quarter FY07
- NSSL – completed a set of radar-only and multisensor precipitation grids for the cool season case and forwarded them to other participants. Rainrate grids forwarded to NESDIS for input to ScAMPR satellite/radar algorithm
- OHD – completed a set of MPE/HPE radar-only, gauge-only, and multisensor precipitation grids, and carried out an initial analysis of their quality with respect to the reference rain gauges. It appears that the radar information in the multisensor grids adds slightly to the quality of the gauge-only analyses, possibly because the study period was dominated by stratiform rainfall with only one convective event
- Some further analysis of the OXFO rain gauge site record was carried out by OHD and NCDC – it now appears there were problems with freezing precipitation and/or gauge mechanics during part of the period, which will be dropped from the reference dataset
- Examination of the meteorological record indicated frozen precipitation over the basin during one of the storm events. Therefore the hydrologic model simulations must be run with hourly surface temperature input – a dataset from RUC and Eta model analyses and forecasts was gridded for this purpose
- AMS Hydrology Committee accepted an abstract for a paper to be presented at the upcoming Hydrology Conference (January 2008)

1st Quarter FY08
- Compared and analyzed the NMQ and HPE radar-only QPE analyses for the Dec 2004 – Jan 2005 period. It appears the NMQ handled challenging situations with unusual Z-R relationships better than did the NEXRAD PPS-based HPE. This resulted in the NMQ estimates having the smaller bias and smaller random error components. Results for both rain gauge and RDHM hydrologic model intercomparisons were consistent.
- Compiled results into a preprint for the AMS 22nd Hydrology Conference in January
- Funding to complete the analysis of warm season cases was applied for through AHPS process

2nd Quarter FY08
- Results of cool-season study were presented in a poster session at AMS Hydrology Conference
- After re-examination of rain gauge reports, reran MPE/HPE for the cool-season period, and obtained multisensor (gauge-radar) as well as radar-only fields
- Reran RDHM hydrologic simulations with MPE and HPE input fields – results will be analyzed next quarter
- Carried out manual inspection and QC of HADS hourly gauge reports for September 2003 and June 2006 study periods

3rd Quarter FY08
- NSSL submitted Q2 gauge-radar precipitation analyses for cool season case; OHD converted them to xmrg format
- Researchers collaborated on collection and quality control of gauge data for the two warm season cases
- OHD completed generation of input radar products for warm season cases

4th Quarter FY08

- Completed rain gauge QC and selection of reference gauges for two warm-season events. OHD created radar-gauge MPE products for Sep 2003 Isabel case.
- An abstract on the project results was accepted for presentation at upcoming AMS hydrology conference
- NSSL completed generation of input radar products and created radar-gauge Q2 products for Sep 2003 Isabel case and June 2006 Alberto case

1st Quarter FY09

- Completed generation of MPE/HPE datasets for June 2006 case
- For the June 2006 (TS Alberto) case: completed analysis of HPE and NMQ radar-only and gauge-radar accuracy, in terms of rain gauge-reference verification scores and RDHM simulations of discharge at 7 gauging points.
- For Sep 2003 Hurricane Isabel case, discovered a problem with NMQ radar analysis, and prepared for case reruns.
- Based on issues with changes in code versions and algorithm improvements since the start of the experiment, decided to rerun NMQ analyses for all cases prior to making a final analysis.
- NSSL verification system and case study library updated and configured to include HPE results to use common verification system and calculations

2nd Quarter FY09

- Completed radar-only QPE analyses for NMQ and MPE/HPE for all three storm periods
- Obtained stream discharge measurements for all study basins, January 2003 through June 2006
- Ran RDHM with SERFC operational precipitation estimates for the period January 2003 through June 0206 and obtained some verification statistics on its performance
- Began re-checking rain gauge data after closer examination revealed some problems with time shifts in reconstructing hourly rainfall totals from 15-minute totals

3rd Quarter FY09

- Completed checking of all rain gauge data
- Elected to use only ASOS rain gauges, which are supplied with heating elements, as multisensor input for the Dec-Jan 2004-2005 events
- Completed RDHM simulation runs for all seven study basins, using radar-only and MPE/HPE gauge-radar input precipitation. Results appear reasonable; in particular NMQ radar-only precipitation yielded discharge simulation results similar to those which were generated using operational Stage 4 precipitation
- On track to complete journal article during August

Problems Encountered/Issues

1st Quarter FY07 - None

2nd Quarter FY07 – None

3rd Quarter FY07 - None

4th Quarter FY07

- Some delays required to track down potential problems with reports from one reference gauge, and to collect/prepare temperature input to RDHM.

1st Quarter FY08

- Some delays required to track down potential problems with reports from several rain gauge sites; must rerun multisensory analyses for the cool-season case Jan-Dec 2004-2005. Results to date are sound, however.

2nd Quarter FY08 - None

3rd Quarter FY08

- Some delays to perform thorough QC on warm-season rain gauge data, and to track down rain gauge reports from different sources that appeared or vanished between 2003 (the Isabel case) and June 2006

4th Quarter FY08

- Had to recreate Q2 radar-gauge multisensor analyses for Dec-Jan 2004-05 events, due to metadata error.

1st Quarter FY09

- Discovered problems with NMQ radar analyses for Sep 2003 event – will reanalyze

2nd Quarter FY09

- Need to re-check and recreate some rain gauge information; still anticipate completion by Q4 of FY09

3rd Quarter FY09

- None this quarter

Gauge-Radar Analyses in High-Resolution Precipitation Estimator (HPE)

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: David Kitzmiller

Objective: Include a capability for rapid-update gauge-only or gauge-radar gridded precipitation analyses in HPE

Milestones

Task	Due Date	Status
Demonstrate features of 15-minute gauge-radar analyses based on continuous-reporting rain gauges and HPE 15-minute radar estimates	FY08 Q3	Complete
Advise on appropriate radius of influence for individual gauge reports	FY08 Q3	Complete
Develop software for inserting rain gauge information from Point Data Control application in radar-based rain estimate grids from HPE; *anticipate initial field trials through AWIPS Test and Notification (ATAN) procedure*	FY08 Q4	To be extended

Accomplishments/Actions

2nd Quarter FY08
- Collected requirements for the application from staff at WFO Monterey and Sacramento and Western Region headquarters
- Derived basic gauge-radar merging algorithm, which preserves gauge-based values in the grid

3rd Quarter FY08
- Using the gauge-radar merging algorithm, applied to 15-minute rain accumulations from radar and dense rain gauge networks over Florida, a set of graphics were developed and sent to field sites and HSEB for comment

4th Quarter FY08
- After examining experimental objective analyses using different interpolation methods, will advise use of a 10-km radius of influence for the gauge data. It can be blended with radar data in a range annulus of 5-10 km relative to the nearest gauge.
- Algorithm description document drafted – for nearest neighbor and inverse distance weighting approaches to grid interpolation

1st Quarter FY09
- Worked on modifying existing Point Data Control codes to estimate 15-minute rain gauge totals from randomly-timed subhourly accumulation reports
- Ran performance tests of nearest-neighbor and inverse-distance weighting analysis algorithms

2nd Quarter FY09
- Visited WFO PSR (Phoenix) and learned about their use of reports from a dense rain gauge network covering the Phoenix metropolitan area
- Tested an AWIPS version of the rain gauge-only HPE algorithm in NHOR, using a locall-available, sparse gauge database. Within that limitation, the algorithm appears to function properly

3rd Quarter FY09
- Limited work this quarter, due to staff time allocation to CHPS acceleration tasks

Problems Encountered/Issues

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 - None

1st Quarter FY09 – N/A

2nd Quarter FY09

- Work is on hiatus, with personnel concentrating on CHPS forcings code needed in FY09

3rd Quarter FY09

- Work still on hiatus, but possibility for restarting in FY10

Satellite Based Analysis for Potential Evaporation

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: David Kitzmiller; project lead Yu Zhang

Objective: To provide satellite-based, real-time PET estimates and nowcasts as input forcing for the Community Hydrologic Prediction system (CHPS)

Milestones

Task	Due Date	Status
1. Research results and recommendations of PET estimation and forecast frameworks*	FY10/Q1	On track
2. System for infusing temperature, humidity, wind data	FY10/Q1	
3. Preprocessors of GOES-based solar radiation	FY10/Q1	
4. PET computation and corroboration	FY10/Q2	
5. Research paper on evaluating estimated PET*	FY10/04	
6. Preprocessor for NDFD gridded forecasts	FY11/Q1	
7. PET forecast framework	FY11/Q1	
8. Research paper on evaluating PET and soil moisture forecast*	FY11/Q2	

Accomplishments/Actions

2nd Quarter FY09

- Initial research underway – literature review and review of OHD's previously supported research by U. New Hampshire
- Collected some RTMA GOES-based cloud cover grids for the CONUS, for potential use as a proxy for manual sky cover

3rd Quarter FY09

- Drafted HOSIP statement of need and began draft project plan
- Reviewed methodology being worked on involving other GOES radiation products, such as sky cover, at other locations
- Continued product collection

Problems Encountered/Issues

2nd Quarter FY09

- Funding not committed until FY09 Q3

3rd Quarter FY09 - None

Test Space-Based Radar Calibration of GOES Precipitation Estimates and the Potential Impacts on Streamflow Forecasting

Core Goal: Improve the quality of physical inputs and forcings

Management Lead: David Kitzmiller; project lead Yu Zhang

Objective: To evaluate satellite QPE derived via SCaMPR framework with TRMM-radar ingest for streamflow forecast

Milestones

Task	Due Date	Status
9. Accumulate SCaMPR output *	FY09/Q4	On track
10. Carry out rain gauge validation study	FY09/Q4	On track
11. Configure MPE and generate SCaMPR-based MPE products	FY10/Q1	On track
12. Generate MAPX for test basins	FY10/Q2	On track

Accomplishments/Actions

2nd Quarter FY09

- Retrieved part of the SCaMPR data
- Configured and tested MPE to allow ingest of SCaMPR data
- Processed rain gauge and DPA data needed for MPE runs
- Evaluated the hourly SCaMPR data on the basis of newly processed LCRA rain gauge data

3rd Quarter FY09

- Retrieved additional SCaMPR data
- Contacted NESDIS on the status of data delivery; modified the HOSIP document to reflect the delay
- Performed MPE merging with SCaMPR data ingest and conducted evaluation on bias-corrected SCaMPR data
- Conducted evaluation of SCaMPR

Problems Encountered/Issues

2nd Quarter FY09

- Funding not committed until FY09 Q3

3rd Quarter FY09 - None

Flash Flood Services

Distributed Hydrologic Model with Threshold Frequencies (DHM-TF)

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Michael Smith

Objective: Understand the nature of the model errors when running a distributed hydrologic model forced by WFO type data streams (e.g. 15 minute resolution observations and nowcasts). Do additional historical precipitation analysis to support the threshold frequency approach. Collaborate with the Sterling WFO to evaluate the model applied to two domains in MD.

Milestones

Task	Due Date	Status
1. Help Sterling and Pittsburgh set up prototype model	FY09 Q4	Ongoing
2. Run historical hydrologic simulations to generate gridded statistics.	Q3	Complete
3. Complete historical analysis begun in 2007 (events and overall statistics for selected basins)	Q4	Complete
4. Monitor real-time HL-RDHM runs; archive and analyze case studies	FY09 Q1	Complete
5. Maintain and monitor MPN runs within OHD	FY09 Q1	Complete
6. Additional work to improve and understand the limitations of the Poor Person's re-analysis; develop data set for a second RFC	FY09 Q2	Complete
7. Recommend high level requirements for operational development	FY09 Q4	Ongoing
8. Publish results	FY09 Q4	Ongoing

Accomplishments/Actions

1st Quarter FY08
- Completed 2007 task: corrected statistical algorithms to properly account for zero flows in dry areas

2nd Quarter FY08
- Completed 2007 task: completing first cut Poor Person's re-analysis for MARFC

3rd Quarter FY08
- Began initial 4km simulations and analysis of Maryland case study.
- Constructed basic set of GRASS GIS visualization scripts needed by OHD and MARFC.
- Communicated with Joe Ostrowski of MARFC to ensure close collaboration on DHM-TF project.

4th Quarter FY08
- Finalized parameterizations for 4km and 2km implementations
- Completed historical simulations needed to compute gridded statistics
- Conducted initial set of historical analyses to further study behavior of DHM-TF system
- Monitored real-time HL-RDHM simulations and MPN runs within OHD

1st Quarter FY09
- Completed Grass GIS and Google Earth scripts needed to visualize DHM-TF output
- Modified code to deal with low and high flow cases with return periods not solvable by traditional technique
- Began coordination work with Sterling WFO necessary to implement DHM-TF on Sterling

computer system.
- o Presented DHM-TF at MARFC WFO and secured agreement to implement DHM-TF at MARFC after the system has been implemented at the Sterling WFO.

2nd Quarter FY09
- Enhanced Google Earth scripts needed to visualize DHM-TF output
- Contacted Pittsburgh WFO and obtained their support and necessary WFO computer account access for efforts to implement DHM-TF prototype at WFO
- Began derivation of routing parameters over Pittsburgh domain
- Redeveloped HOSIP project plan for DHM-TF, also, work will be continued under new AHPS project
- Investigated potential collaborative opportunities with ABRFC, in particular with respect to their low water crossing survey effort
- Developed new DHM-TF case study over Maryland and published in EWRI Water Congress 2009 paper

3rd Quarter FY09
- Continued to enhanced Google Earth programs and scripts needed to visualize DHM-TF output
- Transferred DHM-TF code and supporting data to Pittsburgh server and began initial setup and testing of model
- Completed derivation of routing parameters over Pittsburgh domain
- Traveled to CBRFC to define areas of collaboration between their DHM-FSR research and OHD's DHM-TF research. Bi-monthly telecons will be conducted to share information on WFO feedback, visualization and verification efforts, and model performance
- Ran baseline simulation necessary to support local routing option. Tested local routing option against channel routing option on June flash flooding event in Maryland.
- Presented DHM-TF overview at EWRI 2009 Water Congress.

Problems Encountered/Issues

1st Quarter FY08
- We got a basic real-time run setup for the 4-km MD domain in the fall of 2007, but we did not have time to monitor, archive, and analyze case studies due to Seann's move to the Hydraulics Group and Ziya's extended leave in the fall.

2nd Quarter FY08
- Seann Reed, DHM-TF developer and leader, has been reassigned to the River Mechanics group. Replacement is planned to start work in Q3 FY08.

3rd Quarter FY08
- Overall progress was greatly slowed by staff changes. Replacement for Seann Reed was hired and began work on DHM-TF project in June.

4th Quarter FY08
- Investigation is currently underway to determine the length of flow history needed for accurate computation of return periods. Computation may not be robust under certain situations if only 10 years of data is used.

1st Quarter FY09
- o Certain low and high flow cases lead to return periods that are not solvable by traditional approach. A temporary solution has been put in place, but a more robust (higher precision) solver needs to be implemented.

2nd Quarter FY09
- Due to personnel resource issues at the Sterling WFO, work with them was put on hold. Pending resource availability, work will resume with Sterling over the next quarter.
- Routing parameters are proving to be challenging to derive due to the size of the mainstem

rivers in the Pittsburgh domain

3rd Quarter FY09

- Progress slowed as resources were diverted to conduct research into the Red River flooding events of Spring 2009.

Flash Flood Potential Index

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Greg Smith (Colorado Basin RFC)

Objectives: FY06 – 4th qtr FY08:
- Deliver FFPI output to several NWS offices for evaluation / feedback
- Incorporate a dynamic soil moisture component into FFPI
- Evaluate best platform for FFPI should utilize (based on feedback)

FY07 – FY08 - Explore / Expand FFPI use in the generation of FFG.
FY08 - Potential for future expansion / improvements for FFPI beyond FY08.
FY09 4th qtr – Complete recommendations to FF Services for CONOPS.

Milestones:

Task	Due Date	Status
Acquire & Prepare finer resolution GIS datasets	4th qtr FY06	Completed
Update and incorporate methodology and application process	4th qtr FY06-FY07	Completed
Ability to create FFPI on a national scale and document process	4th qtr FY06-FY07	Completed (CONOPS decision)
Identify offices willing to evaluate product	3rd qtr FY06	Completed
Deliver-Test static product – obtain / incorporate feedback	4th FY06-1st qtr FY08	Completed
Incorporate a dynamic soil moisture component (ext to to FY09)	4th qtr FY06-FY09	Removed from plan/complete
Acquire FF Event Data / Verify FFPI Output (ongoing – ext to FY09)	4th qtr FY06-FY08	Completed)
Define a method to incorporate FFPI in FFG generation (ext to FY07)	4th qtr FY06-FY07	Completed
Peer Review of FFPI Methodology / Application	FY06-FY09	Completed (& Ongoing)
Re-define future CONOPS based on testing / evaluation	4th qtr FY09	On Schedule
Recommendations for CONOPS & Improvements/Updates	4th qtr FY09	On Schedule

Accomplishments/Actions

1st Quarter FY06
- Obtained MRLC 30 meter resolution land-use dataset for conterminous U.S.
- Obtained national forest density dataset.
- Converted and merged approximately 25-30% of MRLC data required for application
- Visited PHX WFO (CBRFC funded) to implement initial FFPI for testing/feedback.

2nd Quarter FY06
- Continued to merge MRLC datasets required for application
- Acquired national DEM dataset required for application
- Identified several offices willing to test/evaluate product

3rd Quarter FY06
- Identified scale & methodology issues and addressing these.
- Completed FFPI for LAX office (western region test office)
- Set list of alpha test stations for initial FFPI testing
- Continued to manipulate national datasets for use in FFPI procedure

4th Quarter FY06
- Converted all available MRLC datasets for use in FFPI procedure.

- Developed initial implementation plan for Alpha test sites.
- Continue to manipulate remaining datasets for utilization in FFPI process.
- Continued to manipulate national datasets for use in FFPI procedure.

1st Quarter FY07
- Re-sampled datasets to FFPI grid-cell resolution for alpha test site regions.
- Loaded alpha test site geographic boundaries and clipped datasets to match.
- Met with USFS remote sensing center to verify proper application of wildfire burn data.
- Developing a process with USFS for obtaining wildfire burn data for FFPI application.
- Obtained numerous wildfire burn area datasets for FFPI application.
- Continued to manipulate national datasets for use in FFPI procedure.

2nd Quarter FY07
- Completed creating FFPI for RNK test sites (working on delivery methods).
- All Data acquired for conterminous test sites, ABQ/SGF near completion
- Started review of GRASS GIS and GFS as working environments for FFPI
- Developed FFPI-FFG methods for the CNRFC

3rd Quarter FY07
- Completed FFPI for ABQ (have not yet delivered)
- Developed a checklist for evaluation FFPI performance at test sites
- Identified possible soil moisture components for application to FFPI
- Incorporated FFPI into FFG development at CNRFC
- Visited Las Vegas office and delivered FFPI

4th Quarter FY07
- Modified methodology for incorporating slope data layer into FFPI
- Tested Arc-IMS as an option for delivery of product to FFPI
- Continued to develop final FFPI for CONUS and SJU sites. These are nearly complete.

1st Quarter FY08
- Completed FFPI for SGF.
- Incorporated finer resolution DEM data for SGF, ABQ, and RNK sites.

2nd Quarter FY08
- Successfully moved FFPI to the GFE (Graphical Forecast Editor) platform
- Continued analysis and development focused on incorporating finer resolution DEM

3rd Quarter FY08
- FFPI completed for all sites except HFO, work is ongoing for that site (4th qtr completion)
- Scheduled visits to beta test sites to be completed in the 4th quarter.
- Significant progress was accomplished toward final delivery of FFPI to beta test sites.

4th Quarter FY08
- Traveled to AGF, installed FFPI files for review and gave presentation to staff.
- Traveled to ABQ, installed FFPI files for review and gave presentation to staff.
- Traveled to SJU, Installed FFPI files for review and gave presentation to staff.
- Installed RNK FFPI remotely and gave a presentation to RNK Staff.
- Installed SGF FFPI remotely and gave a presentation to SGF Staff.
- Update GJT FFPI files remotely
- Completed FFPI for HFO
- Obtained initial feedback in order to prepare recommendations to FF Services.
- Reviewed FFPI role in gridded FFG - Determined CBRFC course of action.

1stQuarter FY09

- Beta test sites requested more time to evaluate. Some initial feedback has been obtained.

2nd Quarter FY09
- Continued to evaluate feedback from FFPI beta sites.
- Discussed strategic options with OCWWS HSD toward making FFPI available to NWS offices.

3rd Quarter FY09
- Planned a late 3rd qtr or 4th qtr delivery of recommendations for FFPI use in WFO's, along with a blue print for setting up FFPI locally in an attempt to complete the project.

Problems Encountered/Issues

1st Quarter FY06
- Some slowdown encountered do to lack of available software licenses
- Some slowdowns do to processing power required, storage requirements for finer resolution data sets.
- Timetable subject to RFC operational responsibilities (minimal impact to date)
- Acquiring timely wildfire burn severity data from the forest service is still challenging. WRH has conducted meetings aimed at accelerating this process and I've been involved in those. Unfortunately this process isn't under NOAA's control**.**

2nd Quarter FY06
- RFC workload / operational responsibilities have had a significant impact on 2nd (and 3rd) quarter development. Most of these tasks will slip at least 1 qtr. Still hopeful to accomplish many 4th qtr tasks on time.

3rd Quarter FY06
- RFC workload / operational responsibilities continued to impact development. Less impact is anticipated during the 4th qtr and early FY07. Some tasks and product delivery will slip into the first half of FY07.

4th Quarter FY06
- RFC operational responsibilities occasionally impact development, otherwise no major issues.

1st Quarter FY07
- RFC operational responsibilities occasionally impact development, otherwise no major issues.

2nd Quarter FY07
- RFC operational responsibilities occasionally impact development, otherwise no major issues.

3rd Quarter FY07
- No real problems but RFC responsibilities occasionally impact development and delivery schedule.

4th Quarter FY07
- No real issues, RFC operational responsibilities and associated travel for training have pushed delivery into early FY08.

1st Quarter FY08
- Minor problems encountered with some FFMP Basin Files. Currently trying to re-acquire some FFMP basins.
- No other real issues, RFC operational and basin focal point responsibilities occasionally impact development activities.

2nd Quarter FY08
- Moderate to significant impact to development during 2nd qtr due to RFC operational and focal

point responsibilities.
- Problems were encountered with some DEM data acquired from NSSL. Re-acquired this data from the USGS.

3rd Quarter FY08
- No issues encountered during the 3rd quarter.

4th Quarter FY08
- No issues.

1st Quarter FY09
- No issue, just more time has been requested for evaluation.

2nd Quarter FY09
- No issues.

3rd Quarter FY09
- No issues

Evaluate Gridded Flash Flood Guidance (GFFG) Approaches

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Michael Smith

Objective: Quantitatively evaluate the ABRFC and OHD TF-GFFG approaches. Use observed streamflow data from small basins, grid inter-comparison techniques, and new verification data collected by NSSL. Evaluate NOAA-NESDIS percent impervious surface area (ISA) data for modeling applications in urban/suburban basins.

Milestones

Task	Due Date	Status
1. Develop joint Project Plan with NSSL for evaluating ABRFC and OHD GFFG approaches	FY08 Q2	Complete
2. Support NSSL led efforts to collect new verification data (advisory role only)	Q3	Complete
3. Finalize and check TF-GFFG codes	Q3	Complete for 1 hr GFFG
4. Complete initial assessment of impervious surface area data for small basins	Q3	This should be re-scoped as a separate project.
5. Provide TF-GFFG programs and analysis scripts to NSSL	Q3	Complete
6. Assist NSSL with running HL-RDHM and generating TF-GFFG	Q4	Complete
7. Assist NSSL in documenting results	FY09 Q2	Delayed*

*See "Problems Encountered" for 1st and 2nd Quarter FY09.

Accomplishments/Actions

1st Quarter FY08
- Revised plans due to personnel changes. Reduced the project scope. NSSL work will fill in some gaps.

2nd Quarter FY08
- Worked with NSSL on the project plan. NSSL got ABRFC involved and their feedback significantly improved the plan.

3rd Quarter FY08
- Replacement for Seann Reed hired and is rapidly coming up to speed.
- Seann visited NSSL to review project plan with JJ Gourley. JJ and students are wrapping up the 2008 SHAVE experiments (including flash flood verification data collection) and are now ready to begin analysis for this project.

4th Quarter FY08
- Provided NSSL with TF-GFFG analysis scripts and programs
- Gave guidance to NSSL in the execution of HL-RDHM and production of TF-GFFG fields

1st Quarter FY09
- NSSL has wisely re-scoped this project and put in a new AHPS proposal for FY09.

2nd Quarter FY09
- JJ Gourley at NSSL is continuing work on this project. His student, Jessica Erlingis prepared a

pre-print for AMS describing the SHAVE flash flood observation data collection experiment.

3rd Quarter FY08

- N/A

Problems Encountered/Issues

1st Quarter FY08

- Seann's move to the hydraulics group has delayed this work.

2nd Quarter FY08

- None

3rd Quarter FY08

- Initial analysis of impervious percent area in Tulsa, OK, shows benefits of using this data but a more complete assessment in the broader context of rainfall-runoff a-priori parameter estimation procedures is recommended. This will require a separate project.

4th Quarter FY08

- Need to continue interacting with NSSL and Ernie Wells to gauge project progress. NSSL is currently working through some issues in comparing regenerated TF-GFFG to the archived ABRFC GFFG. The comparison is complicated by the fact that they are based on different precipitation grids.

1st Quarter FY09

- Since no AHPS resources were actually allocated to this project in FY08, only small amounts of Seann's time and some of JJ Gourley's time were available during the past year. JJ has put together an improved proposal for FY09 compared to what we had in FY08 to try to get enough resource for a student to work on this project at NSSL. OHD will likely remain a supporting role as we have no explicit resources allocated for this.

2nd Quarter FY09

- JJ is still working on this project but with limited resources so the schedule is delayed. He currently has only one undergraduate student working 10 hours per week. They plan to present initial results at the AMS Radar Conference to be held Oct. 5 - 9, 2009.

3rd Quarter FY09

- N/A

Improve Guidance for DamBreak Forecasting

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Seann Reed

Objective: Identify a nationally supportable, consensus set of dam break modeling procedures and document them in a NWS Dam Break Forecasting Guidance Document. Provide any prototype tools necessary to implement these procedures. Identify formal software engineering requirements to develop improved tools

Milestones

Task	Due Date	Status
1. Review existing dam break procedures.	FY09 Q3	Complete
2. Gather information on USACE "Mapping Inundation and Production Center" activities	FY09 Q3	Complete
3. Develop/evaluate procedures to convert existing dam break models (in SMPDBK, FLDWAV, or DAMBRK) to HEC-RAS.	FY09 Q4	On track
4. Identify/document best method to quickly derive cross-sections for dams with not existing models	FY09 Q4	On track
5. Coordinate with Army Corps of Engineers to get updates on the NID database and identify how these updates are used at RFCs and WFOs.	FY09 Q4	On track
6. Write guidance document for existing procedures	FY10 Q1	On track
7. Prepare training materials	FY10 Q2	On track
8. Identify software engineering requirements to develop improved tools	FY10 Q4	On track
9. Journal Publication	FY10 Q4	On track

Accomplishments/Actions

2nd Quarter FY09

- Developed HOSIP Project Plan and scheduled Gate 2 meeting.
- Collected data on several dams to use in the study.
- Developed questionnaire and began reviewing existing dam break modeling procedures.
- Continued to experiment with HEC-RAS dam break functionality.

3rd Quarter FY09

- Fekadu presented Project Plan at HOSIP Gate 2 meeting and it was approved.
- Fekadu and Seann met with John Hunter and Gary Brunner to gather information on USACE modeling activities (Task 2).
- Fekadu and Seann met with Don Cline, Victor Hom, Tom Graziano, John Hunter, and others to discuss IWRSS activities and potentially using dam break data exchange as an early demo (Task 5).
- Fekadu and Cecile learned about new web access to NID (Task 5).
- Fekadu, Cecile, and Lizeidy (student intern) worked on building SMPDBK, FLDWAV, and HEC-RAS models for four dams (Big Bay, Teton, Buffalo Creek, and Gilboa Dams) (Task 3)
- Fekadu sent a survey to three RFCs and consolidating feedback (Task 1)
- Cecile began investigating MapTech and learning advanced features of HEC-GeoRAS (Task 4).
- Fekadu added Marty Pope (Jackson WFO) as a project sponsor.

Problems Encountered/Issues

2nd Quarter FY09 – None

3rd Quarter FY09 - None

FFMP Small Basin Support

Core Goal: Improve forecasts of fast response hydrologic events

Management Lead: Ami Arthur, NSSL

Objective: To provide training and assistance to all WFOs for customization of the FFMPA small-basin shapefile datasets and to coordinate and facilitate the sharing of customized files to prevent duplication of efforts among WFOs.

Milestones

Task	Due Date	Status
1. FFMPA Dataset Tier II/ III Customization Webinars	TBD	
2. Coordination of dataset sharing via the Basin Customization Repository	Ongoing	In progress
3. Provide technical assistance for dataset customization	Ongoing	In progress

Accomplishments/Actions

1st Quarter FY08

- During this quarter, the Basin Customization Repository was populated with customized datasets that had been submitted for sharing with other WFOs. We also continued to provide instructions and assistance to WFOs for several issues related to their datasets and basin customization efforts.

2nd Quarter FY08

- During this quarter, several potential workarounds/solutions for reducing the number of FFMP basin names seen in WarnGen output were investigated. We also continued to provide instructions and assistance to WFOs for their datasets and customization efforts.

3rd Quarter FY09

- Material is being assembled for the customization webinars. The dates for the webinars have not yet been set, but they will likely begin during the early Fall with the intent of maximizing attendance by avoiding the summer vacation season. In this quarter, we have also continued to provide technical assistance to FFMPA dataset users.

Problems Encountered/Issues

1st Quarter FY08

- none

2nd Quarter FY08

- none

3rd Quarter FY09

- none

Routing (Hydraulics)

Transition from FLDWAV to HEC-RAS

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Develop scientific guidance and prototype data conversion tools to assist FLDWAV users transitioning to HEC-RAS. Guidance developed will include information on reproducing existing FLDWAV model results within HEC-RAS, developing new computationally stable and accurate models in HEC-RAS, and model calibration using HEC-RAS. Support requirements development and prioritization for the HEC-RAS into CHPS project.

Milestones

Task	Due Date	Status
Draft HOSIP Project Plan	Q2	Complete
Develop and analyze Tar River models	Q3	Complete
Validate HOSIP Project Plan with field hydraulics experts and prioritize requests for HEC-RAS enhancements.	Q3	Complete
Develop and analyze Columbia River models	Q3	Complete
GoTo Meeting Status Report	Q4	Complete
Identify and test conversion of FLDWAV modeling options not used in the Tar and Columbia R. test cases.	FY09 Q1	Complete
Make data conversion programs available to RFCs	FY09 Q1	Complete
Write technical paper and guidance documents	FY09-Q2	Complete
Continue to support CAT RFCs in model transition	FY09-Q2	Ongoing
Continue to support non-CAT RFCs in model transition	FY10-Q4	Ongoing

Accomplishments/Actions

1st Quarter FY08
- Project team began learning HEC-RAS.
- Project team began developing Tar R models.

2nd Quarter FY08
- Seann took over as project leader.
- Developed draft HOSIP Project Plan.
- Project team continued to learn HEC-RAS (and FLDWAV and DWOPER) and DSSVue.
- Developed and tested symmetric and actual HEC-RAS models for the Tar R.
- Developed FORTRAN program to convert cross-section and bridge geometry from FLDWAV to HEC-RAS format
- Adapted LMRFC Python scripts to convert calibration data into DSS format.
- Began collecting data to build Columbia River models
- Devised and carried out key experiments to understand differences in FLDWAV and HEC-RAS models

3rd Quarter FY08
- Assisted HSEB to define task orders for HEC-RAS into CHPS software requirements.
- Fekadu took formal unsteady flow training at HEC and begin transferring knowledge to the group.
- Angelica worked on calibrating the actual Tar R model.
- Angelica studied bridge representations in the actual Tar R. model.

- Fekadu made initial conversion of a DWOPER model for the Lower Columbia to HEC-RAS.
- Fekadu obtained an alternate Lower Columbia model from HEC and began configuring it with the same boundary conditions as the Tar R model.

4th Quarter FY08

- Joanne Salerno (NWRFC) visited OHD and helped advance our model testing for the Columbia River.
- Fekadu has made excellent progress in enhancing our symmetric HEC-RAS lower Columbia model to more closely match the operational DWOPER implementation.
- Fekadu visited NERFC to assist in our understanding of other modeling issues that may not be apparent from our Tar and lower Columbia test cases.
- Seann and Angelica began outlining and filling in information in our final guidelines document (much of the content is from Fekadu's work).
- We submitted an abstract on the project for next year's ASCE/EWRI conference. Authors are Fekadu, Angelica, Seann, and Cecile.
- Fekadu, Angelica, and Seann made progress in improving Python scripts to help in model conversion, comparisons, and calibration.

1st Quarter FY09

- We added features to the fld2ras program to handle ineffective areas and the AS parameter.
- We continued to improve the calibration for our lower Columbia models.
- We started the EWRI Paper and complete it in January.
- We are making progress on the first draft of the full documentation -- "Guidelines Document". We still have the goal of completing the first draft by Jan. 31.
- We are helping to coordinate training needed for the FLDWAV to HEC-RAS transition.

2nd Quarter FY09

- Completed the Guidelines document (80 pp)
- Scheduled Steady-state and Unsteady State (CAT only) training classes.
- Solved a problem with lower Columbia simulations related to the definition of junctions that substantially improves our simulations.

3rd Quarter FY09

- Fekadu, Seann, and Angelica delivered unsteady state (CAT only) training at NERFC.
- Seann, Fekadu, and Angelica continued to assist CAT RFCs with model conversion and calibrations. We helped make substantial improvements to the lower Columbia model.
- Seann participated in an advisory role with Deltares/HSEB on finalizing and testing HEC-RAS within CHPS.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY09

- None

3rd Quarter FY08

- None

4th Quarter FY08

- None

1st Quarter FY09

- Although we have made progress on HEC-RAS lower Columbia models, comparisons in simulation mode for the calibration period originally used by NWRFC will not be definitive enough to accept or reject the models as replacements for the DWOPER model in operations.

We can still make some improvements in calibration mode, but we recommend setting up the HEC-RAS model within CHPS and make side-by-side comparisons in forecast mode as soon as possible. We will work towards this in FY09 Q2 and Q3.

2nd Quarter FY09

- None

3rd Quarter FY09

- None

River-Estuary-Ocean Modeling to Enhance Operational River Forecasting -- Chesapeake Bay Study Area

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Provide an accurate hydraulics model that extends from river mouths upstream to at least existing forecast points and beyond if necessary to achieve accuracy. Provide accurate river flow forecasts to NOS operational estuary models. Evaluate 2D/3D models or a combination of HEC-RAS and 2D/3D models to meet the goals.

Milestones

Task	Due Date	Status
1. Develop plans (identify models to use, connect with collaborators, identify resources)	FY09 Q2	Initial plans complete, ongoing refinement
2. Acquire software and initial models from collaborators	FY09 Q2	Partially complete (see problems section)
3. Build and test HEC-RAS, ADCIRC, and Mike Flood FM using historical data	FY09 Q4	Partially complete (see problems section)
4. Interim report/presentation	FY10 Q1	On track
5. Build and test SELFE model using historical data; possibly include Delft 2D/3D	FY10 Q3	Not started
6. Publish results and recommendations for operational implementation	FY10 Q4	Not started

Accomplishments/Actions

1st Quarter FY09
- Began discussions with NOS folks and participated in IOOS related meetings/presentations.
- Developed plans.
- Acquired flexible mesh data to support Chesapeake Bay modeling.
- Acquired HEC-RAS cross-section data for the Potomac River

2nd Quarter FY08
- Mashriqui made a presentation at the 63rd Interdepartmental Hurricane Conference.
- Mashriqui began building, testing, and refining a HEC-RAS model for the Potomac River.
- Mashriqui and Seann participated in more extensive discussions with NOS/CSDL.

3rd Quarter FY09
- Mashriqui acquired an NCEP supercomputer account to facilitate ADCIRC runs.
- Mashriqui and Seann attended ADCIRC meeting in Silver Spring.
- Mashriqui gathered more information on the SLOSH model and the Columbia River SELFE model.
- Mashriqui participated in NOAA Storm Surge Team meetings and in HMT-SE planning meetings.
- Mashriqui and Seann met with NCEP's Marine Modeling and Analysis branch to discuss the project.
- Mashriqui finished building an initial HEC-RAS model for the Potomac River. Sean and Cecile reviewed the model and provided suggestions. Mashriqui did some calibration, wrote up a description and provided the model to MARFC.

Problems Encountered/Issues

1st Quarter FY08

- None

2nd Quarter FY08

- The original proposal was to focus first on HEC-RAS, ADCIRC, and Mike Flood. We wrote a document explaining why these models make the most sense to start with. This document explained the value of using Mike Flood for science investigations to more rapidly advance our understanding of physics and serve as a proven reference (even if Mike Flood is not the operational model to be used). In house use of Mike Flood would have helped us with efficient scientific collaboration with NOS for them to design estuarine model domains with appropriate river boundary and inflow locations. Mike Flood is preferable to other commercial models such as Delft 3D for this study because it uses a flexible mesh, finite volume technique and runs very fast on Windows PC based system compared to similar models that run on super computers. Finite volume technique is the latest in the estuarine and water quality modeling. CSDL/NOS in future plan to utilize finite volume based models (such as FVCOM that runs on super computers). However, there is no funding to purchase Mike Flood software or support; therefore, the initial 2D model to be evaluated will be the academic model ADCIRC. Some comparisons can be made to the operational NOS CBOFS 3 model, but the CBOFS3 mesh does not extend far enough inland to meet the goals of this study. We hope to add other models to the study as resources allow. We will use the commercial model Sobek model for the Wind into HEC-RAS study, but Sobek is not suitable to meet the goals of this project.

- To meet new requirements, we have discussed splitting our initial REO related efforts into two areas: (1) this Chesapeake project focused on improving our understanding of what physics and computational power is required for improving services at RFC forecast points and between these points and estuaries, (2) working towards a CERIS Pilot for Pamlico Sound North Carolina that runs on operational platforms (e.g. NCEP computers and with CHPS at RFCs). It will take time and coordination to develop plans for the second project. More extensive efforts than anticipated on this second project will likely slow progress on the Chesapeake Bay modeling described in this report.

3rd Quarter FY09

- Although we continue to make progress, getting up and running with ADCIRC on NCEP computers has taken longer than expected.

Incorporate Wind Information into HEC-RAS

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Define specific NWS requirements for adding wind modeling capabilities into HEC-RAS and provide them to HEC. Recommend source(s) of wind data, the method to apply 2D wind data in a 1D model, and the shear stress algorithm.

Milestones

Task	Due Date	Status
1. Collect data	FY09 Q2	Ongoing
2. Build models (HEC-RAS and Sobek)	FY09 Q3	HEC-RAS complete, working on Sobek
3. Calibrate models during low wind period	FY09 Q3	Delayed to Q4
4. Validate models	FY09 Q4	On track
5. Provide requirements to HEC	FY10 Q1	On track
6. Publish Results documentation: presentation and paper	FY10 Q1	On track

Accomplishments/Actions

1st Quarter FY09
- Presented and discussed plans with AHPS Theme Team
- Acquired HEC-RAS cross-section data for the Potomac River
- Investigated sources of wind data

2nd Quarter FY09
- Acquired Sobek license and began studying Sobek, including its wind modeling capabilities.
- Mashriqui began building, testing, and refining a HEC-RAS model for the Potomac River.
- Developed HOSIP project plan and passed Gate 2 meeting with minor revisions required.
- Acquired streamflow, stage, and tide data.

3rd Quarter FY09
- Mashriqui finished building the initial HEC-RAS model for the Potomac River. Sean and Cecile reviewed the model and provided suggestions.
- Mashriqui did some calibration of the HEC-RAS model, wrote up a description, and provided the model to MARFC.
- We obtained Sobek license and Mashriqui began learning Sobek. We arranged for a demo from Deltares.
- Mashriqui continued to collect data required for model calibration and validation.

Problems Encountered/Issues

1st Quarter FY09
- None

2nd Quarter FY09
- Delays in getting Sobek license.

3rd Quarter FY09

- Mashriqui has been spending considerable time on outreach and building relationships for collaboration with other NOAA Offices and outside groups. This has slightly delayed work on technical tasks, but we will attempt to get back on schedule in Q4.

Dynamic Inundation Mapping

Core Goal: Improve the routing techniques used to connect forecast locations

Management Lead: Seann Reed

Objective: Develop a method to quantify the limitations of static inundation mapping versus dynamic. Test the method at several NWS forecast points. Evaluate current technologies to generate inundation maps

Milestones

Task	Due Date	Status
1. Develop methods to compare static and dynamic mapping approaches	FY09 Q2	Complete
2. Test method for selected North Carolina static inundation mapping points	FY09 Q3	On track
3. Finalize documentation for North Carolina points	FY09 Q4	On track
4. Begin evaluating available technologies for dynamic mapping	FY09 Q4	Started

Accomplishments/Actions

1st Quarter FY09
- Prepared dynamic models
- Began developing evaluation methodology

2nd Quarter FY09
- Prepared a pre-print for ASCE EWRI focusing on Tar River analysis.
- Presented methodology at Federal ESRI User Conference in Washington, D.C.
- Keren Cepero (graduate student from NC State) joined us for the Spring Semester. She began building a HEC-RAS model for the Neuse River so that we can expand our sample of analysis points.

3rd Quarter FY09
- Seann presented a paper co-authored by Cecile and Keren: "A Comparison of Static and Dynamic Forecast Mapping Techniques" at the ASCE EWRI Conference.
- Keren made progress building a Geo-referenced HEC-RAS model for the Neuse River to expand our sample size for analysis. Several group members provided assistance to Keren. Seann provided lateral inflows generated from RDHM and using SAC parameters provided by SERFC. Calibration and checking of the HEC-RAS model is still needed.
- Keren will continue to work on this project and write her thesis, with plans to complete by September of 2009.
- We've begun gathering information on the new RAS Mapper being developed by (a Windows only application). Also, Mississippi State and LMRFC have received a grant with the Northern Gulf Institute to develop a new Linux-based mapping tool. LMRFC will visit OHD in August.

Problems Encountered/Issues

1st Quarter FY09
- None

2nd Quarter FY09
- It has taken longer than expected to acquire cross-section data for the Neuse but we are still on track.

- The Neuse River model will depend more on the accuracy of lateral inflows from the hydrologic model compared to the Tar River. The radar-based precipitation data we would like to use may not provide good simulations for time periods of interest such as Hurricane Floyd. We are working to address this.

3rd Quarter FY09 - None

Hydrologic Models

Physically-Based Modifications to the Sacramento Model

Core Goal: Improve the forecasts by improving hydrologic models

Management Lead: Mike Smith

Objective: The objectives of this work are to investigate further modifications to the Sacramento model. These include: investigate/modify SAC model to run over cascading planar elements; better treatment of vegetation, perhaps from the NCEP LSM model; treatment of old water/new water in runoff process; treatment of re-infiltration of runoff, etc.

Milestones

Task	Due Date	Status
1. Evaluate need for adding vegetation component to Sac Model. This could include: 1) Evaluate NOAA LSM treatment of vegetation in context of DMIP 2 in OK and Western basins. 2) Evaluate benefit of better PE estimates versus adding vegetation component (i.e. collaborate with Martha Anderson of Beltsville, ARS; get NCEP's PE estimates, evaluate NASA Marshal PE).	FY07 Q4	Done via DMIP 2 and investigation of dry area SAC parameterization.
2. Identify basins with clear evidence of channel re-infiltration. Coordinate with Dave Goodrich of ARS for this; set up RDHM runs for analysis 3. Modify RDHM to test approach if necessary.	FY07 Q4	Delayed
4. Evaluate need for treatment of Mean residence times and old/new water as per seminar by Jeff McDonnell.	FY07 Q4	Delayed
5. Evaluate new NASA PE time series to assess value for hydrologic simulations.	FY08 Q3	In progress
6. Investigate linkage of sub-surface flows in gridded Sac model	Fy09 Q4	In progress
7. Modify SAC-HT for better evapotranspiration treatment	FY09 Q4	In progress

Accomplishments/Actions

1st Quarter FY07

- Initiated new project for physically-based modifications to the Sacramento Model

2nd Quarter FY07

- Time estimates developed for potential modifications to SAC-SMA. Identified NCEP actual PE values as possible path. Evaluation of Blue River in Oklahoma for channel re-infiltration not conclusive. McDonnell commented during the seminar on 'old water' that this concept is probably most geared towards hillslope runoff processes.

3rd Quarter FY07

- Identified Blue River in Oklahoma as one that has channel losses from karst formations. Contacted Dr. Todd Halihan, a hydrogeologist from Oklahoma State University who is very familiar with the Blue River and springs and karst formations. Requested any data for this basin.

4th Quarter FY07

- Provided Guidance to NASA researchers on Joint OHD/NASA project for PE estimates. This work will test the combination of MODIS satellite-derived cloud mask information with ASOS ceilometer data to derive a replacement for the manual sky cover observations required for SYNTRAN. Initial interim results look promising.
- Obtained many papers etc from Dr. Todd Halihan on the hydrogeology of the Blue River basin. Sent one presentation to ABRFC for their use. Hopefully, these will provide useful data.
- Some DMIP 2 participants used the NARR data for evaporation; must evaluate these results

1st Quarter FY08

- Shane Sheldon began analysis to compare the impacts of several different PE sources on simulations in the Blue River.

2nd Quarter FY08

- Found USGS data for the spring in the Blue River (largest in Oklahoma). Sent data to ABRFC. Shane Sheldon tried various values of SAC 'side' parameter to improve simulations for this basin.
- Evaluation of daily PE time series is underway on two basins in Oklahoma: Blue River and Black Bear Creek. The Blue River is somewhat problematic so we switched to the Black Bear Creek. Analyzing 3 PE time series: derived from ASOS cloud height, MODIS cloud mask, and combination of ASOS and MODIS. Advantages compared to monthly climate PE approach not initially obvious, but the PE time series are certainly within a reasonable range.
- Dr. Soroosh Sorooshian of the U. California at Irvine will send a PhD student to work at OHD over the summer. One aspect of the work will be to develop sub-surface linkages of gridded Sac elements.

3rd Quarter FY08

- PhD student Behnaz Kahkbaz from UCI started June 9 at OHD for summer internship. She and Victor developed a physically-based strategy to use the soil moisture levels computed by SAC-HT and channel invert elevations to determine the proportion of interflow and baseflow that would be routed to the downstream grid cell's storages. The SAC fland1.f subroutine was modified for proof-of-concept testing. Hypothetical tests of the modifications showed reasonable results.

4th Quarter FY08

- Concept and initial results of using SAC-HT to model sub surface flow connections presented at DOH 2008 conference. Work continued at UC Irvine.
- Victor Koren developed outline for modifying the SAC-HT model to account for better treatment of vegetation, canopy, and evapotranspiration losses using experience from Noah land surface model. This will be submitted as an AHPS/WR FY09 proposal. This modification is primarily focused on work in dry climates.

1sr Quarter FY09

- Behnaz Khakbaz modified the HL-RDHM to generate a grid cell water exchange for primary and supplemental baseflow based on a concept developed earlier. Started tests with the new structure.
- Victor presented results of his SAC *a priori* parameterization work in dry areas and the deficiency of the SAC model regarding evaporation. Presentation made to RFCs and OHD.
- Victor prepared plan for modifying SAC model for refined evapotranspiration approach. Mike presented plan to AHPS/Water Resources Innovation Theme Team.

2nd Quarter FY09

- SON approved for modifying SAC-HT for advanced evapotranspiration; HOSIP Stage III project plan begun. OHD (Victor Koren) provided guidance and SAC-HT code to U. Washington for their unified land surface model consisting of SAC-SMA and the Noah models.
- Daily PE 4km grids delivered to OHD for 2006 and 2007 for Oklahoma and Texas. Evaluation underway. Initial spatial analyses indicate that a better method is needed to interpolate ASOS observations of meteorologic variables to a grid.
- Linkage of sub-surface elements: Victor Koren provided much guidance to UCI researcher Behnaz Khakbaz. She finished coding of a water exchange component into HL-RDHM. Generated needed parametric data to run the new RDHM version for the Eldon basin. She is planning sensitivity tests using Eldon data. Ms. Khakbaz generated many simulations and experiments noting the sensitivity of model performance to the relationship of channel invert to SAC lower zone storages.

3rd Quarter FY09

- HOSIP Stage III plan approved for this project.

- Modification SAC-HT project: Completed Task 3, formulated SAC-HT water exchange mechanism based on the Noah evapotranspiration parameterization, adjusted software, and performed water balance tests. The algorithm has two options: a) original SAC-HT water exchange mechanism, and b) mixing of Noah-type diffusive mechanism (for tension water) and SAC-HT mechanism (for free water).
- Linkage of sub-surface elements: Behnaz Khakbaz is performing sensitivity tests with the new HL-RDHM water exchange component to quantify effects of subsurface water exchange on greed cell runoff at different scales.

Problems Encountered/Issues

1st Quarter FY07 - None

2nd Quarter FY07
- Hydro group is currently managing 38 major tasks…need prioritization and final budget resolution before moving ahead with new projects.

3rd Quarter FY07
- Hydro group is currently managing 38 major tasks…need prioritization and final budget resolution before moving ahead with new projects.

4th Quarter FY07 - None

1st Quarter FY08 - None

2nd Quarter FY08 - None

3rd Quarter FY08 - None

4th Quarter FY08 – Some delays in receiving time series from NASA Marshall SFC of gridded PE derived from MODIS and ASOS cloud observations. These are expected FY09 Q1.

1st Quarter FY09
- Continued delays in receiving gridded PE data from Marshall SFC.

2nd Quarter FY09
- Continued delays in receiving gridded PE data from Marshall SFC.

3rd Quarter FY09 - None

Calibration - Complete IDMA Study

Core Goal: Improve the forecasts by improving hydrologic models

Management Lead: Mike Smith

Objective: The objective of FY08 work will be to continue and finish a scientific study to evaluate the impacts of not performing (historical) data quality control procedures on precipitation data during hydrologic model calibration.

Milestones

Task	Due Date	Status
1. Obtain data for additional analyses	FY08 Q3	On track
2. Calibrate basin with uncorrected/corrected data	FY08 Q3	On track
3. Analyze calibration results	FY08 Q4	On track
4. Develop and deliver recommendations fo r the RFCs	FY09 Q1	Delayed.

2nd Quarter FY08

- Analyzed gauge only gridded precipitation for the North Fork American River for the 2002 -2006 time period and found consistency issues that resulted in time-varying model biases. Will try to use these data to restart the study. Also found journal paper on the impact of biased and randomly corrupted inputs on the efficiency and the parameters of watershed models. The paper showed: 1) random errors in precipitation significantly affect model performance and parameter values and 2) systematic errors in rainfall time series (biases) when large enough can be very detrimental to model performance. Will send paper to RFC's

3rd Quarter FY08

- None this period

4th Quarter FY08

- None this period

1st Quarter FY09

- Naoki wrote draft paper on DMIP 2 precipitation data inconsistencies in the North Fork American River basin. Reviewed by Hydro group. Mike provided Naoki with references on effects of inconsistent data on model calibration. Mike, Victor, and Naoki discussed continuation of data correction problem by Naoki. Mike will review status of work on Baron Fork at Eldon, OK in order to give to Naoki.

2nd Quarter FY09

- Naoki and Victor continued to revised draft paper on impact of QPE bias in model calibration and simulation using the North Fork American River.

3rd Quarter FY09

- Delays getting journal paper through group review

Problems Encountered/Issues

2nd Quarter FY08

- Task on hold due to loss of 3 group members and other higher priority projects.

3rd Quarter FY08

- Task on hold

4th Quarter FY08

- Task on hold

1st Quarter FY09

- None

2nd Quarter FY09

- Delays getting journal paper through group review.

3rd Quarter FY09

- Delays getting journal paper through group review

Software Refresh

Community Hydrologic Prediction System (CHPS)

Core Goal: Enhance the usability and/or internal workings of existing software

Management Lead: Jon Roe

Objective: Provide an improved software infrastructure for operational use at RFCs, as a replacement for the existing NWSRFS, and which will meet the future forecasting needs of all RFCs.

FY09 Milestones (from FY09 Workplan):

Task/Subtask FY09 Milestones	FY09 Due Date	Current Status
1 CHPS BOC, including HEC-RAS		
1.1. Partial implementation of new operations and interactive forecasting capability in FEWS	Q1	Complete
1.2. CHPS Preparation Workshop #2	Q1	Complete
1.3. Installation of test configurations at CAT RFCs on new hardware	Q2	Complete
1.4. Acceptance testing of new software	Q2	Complete
1.5. CHPS migration training for CAT RFCs	Q2	Complete
1.6. CHPS Preparation Workshop #3	Q2	Complete
1.7. Complete first stage of migration of NWSRFS to CHPS for CAT RFCs	Q3	Delayed until Q4
1.8. CHPS Implementation Workshop #1	Q3	Completed Q2
1.9. Complete second stage of migration of NWSRFS to CHPS for CAT RFCs	Q4	Not started
1.10. CHPS Implementation Workshop #2	Q4	Completed Q3
1.11. HEC-RAS with FEWS: Kick-off meeting	Q1	Complete
1.12. HEC-RAS with FEWS: demo of FEWS display mockups	Q1	Cancelled.
1.13. HEC-RAS with FEWS: Demo FEWS configuration available for NERFC	Q3	Complete
1.14. HEC-RAS with FEWS: Draft documentation	Q1	Delayed until Q4
1.15. HEC-RAS with FEWS: Adapter training to HEC staff in Davis, CA	Q3	Complete
1.16. HEC-RAS with FEWS: Demo of FEWS-based displays & acceptance at NERFC	Q3	Complete
1.17. HEC-RAS with FEWS: Final delivery (adapter software & documentation)	Q2	Delayed until Q4
1.18. HEC-RAS: Finalize Tar R. modeling	Q1	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.19. HEC-RAS: Finalize lower Columbia modeling	Q1	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.20. HEC-RAS: Finalize conversion tools	Q1	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.21. HEC-RAS: Write Guidelines document	Q2	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"

1.22.HEC-RAS: Learn CHPS version of HEC-RAS	Q2	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.23.HEC-RAS: Scientific paper for ASCE/EWRI Conference	Q2	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.24.HEC-RAS: Develop and deliver HEC-RAS conversion training	Q3	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"
1.25.HEC-RAS: Update Guidelines document	Q4	Refer to report on Core Goal 6 "Transition from FLDWAV to HEC-RAS"

Accomplishments/Actions:

1st Quarter FY08

- For more detailed information, please visit the CHPS news and activities page on the Web at: http://www.nws.noaa.gov/oh/hrl/chps/news.html.
- Apex Digital Systems and Dr. Michael Piasecki from Drexel University submitted to OHD a HydroXC proposal for the FY08 Hydrology budget that would build upon work completed in previous fiscal years, and help make the HydroXC work successful and self-sustaining.
- At a workshop hosted by the NCRFC in Chanhassen, MN during the week of December 17, Delft Hydraulics (now Deltares) presented and demonstrated the final version of the CHPS FEWS Pilot system to a group of HICs and RFC hydrologists.
- Based on the CHPS FEWS Pilot system, the CHPS Acceleration Team (CAT) is now satisfied that FEWS is a comprehensive platform which can be adapted to meet the current operational needs of NWS RFCs (i.e., is a suitable foundation for an NWSRFS replacement); and additionally has the potential to meet future needs of CHPS as a whole. The CAT delivered a final recommendation report to Gary Carter summarizing their findings. The NOAA Hydrology Program Manager accepted the findings and endorsed the implementation of FEWS for CHPS.
- Raytheon concluded their analysis of CHPS (FEWS), and delivered a proposal to OHD at the end of October for an approach to the CHPS-AWIPS II interface.
- Acceptance testing of the new ResSim at CNRFC occurred during November. An adequately functional version of ResSim was installed, along with OHD's/Apex's enhanced version of NWSRFS.
- Phase 1 of the HEC-RAS into CHPS project began with a kick-off conference call in December where a proposed project schedule was discussed.
- On October 19 HSEB submitted a "High Level Analysis and Design" document to the XEFS Implementation Team for review.

2nd Quarter FY08

- On January 1 Delft joined forces with several other Dutch water-focused institutes to form Deltares. Visit http://www.deltares.nl/xmlpages/page/deltares_en for more information.
- The CAT delivered its recommendation report to Gary Carter on January 9; the recommendation to proceed with FEWS as the infrastructure component for CHPS was approved. Chris Dietz was named as the CHPS Implementation project leader.
- A successful HOSIP Gate 4 for the CHPS FEWS Pilot Enhancements project was held on February 20.
- The first draft high-level implementation plan was developed; the CAT is holding weekly conference calls to refine details of the plan. A planned 2-day workshop to accelerate development of the plan was postponed at the last minute due to increased flood forecasting operations at NWRFC.
- Karel Heynert from Deltares visited OHD in Silver Spring on February 21, 2008, to discuss and refine the proposed implementation and migration schedule.
- Apex held a series of fact-finding interviews with each of the CAT RFCs, resulting in a report delivered to OHD on March 24 entitled "FEWS Pilot Results".
- OHD HSEB developers have begun work on 7 NWSRFS model operations: CONS_USE,

LAG/K, RES-SNGL, SARROUTE, SSARRESV, TATUM, and UNIT-HG. The PAL for these activities is Joe Gofus.

- HSEB initiated the process of securing access to Deltares through the NWS AWIPS contract with Raytheon.
- Deltares and OHD traveled to LMRFC in February to discuss functional requirements for the HEC-RAS capability in CHPS. OHRFC also attended. The Deltares-OHD team then traveled on to Davis, CA to meet with USACE HEC and its contractor Resource Management Associates (RMA); RMA is the contractor that built the Corps Water Management System (CWMS) in collaboration with HEC. The goal of the meeting in Davis was to discuss potential solutions. Delft, HEC, LMRFC came to an agreement concerning the overall technical solution, which allowed Deltares and HEC to draw up technical proposals; the Deltares proposal was reviewed by the Hydraulics team on March 25. Phase 1 of the project is now complete. Phase 2 - implementation of the proposed solution - will begin once contracts/MOAs are in place with Deltares and HEC.
- The HydroXC effort did not receive any FY08 funding; all work has now been placed on indefinite hold

3rd Quarter FY08

- The CAT met in Portland (NWRFC) on May 1-2 to accelerate progress on planning activities. An implementation plan for CHPS migration was completed.
- In mid-June Rob Shedd, the Development and Operations Hydrologist (DOH) at Northeast RFC (NERFC), became a CAT member. NERFC is now a "CHPS forerunner" site. John Halquist remains a CAT member, but now represents NOHRSC.
- On March 24 Apex Digital Systems, Inc. (Apex) delivered the final version of their document entitled "FEWS Pilot Results".
- Deltares made significant progress on the migration mapping document during a visit between Deltares and OHD the week of April 14.
- The CAT identified requirements for a CHPS Baseline Operational Capability (BOC), defined to be the minimal set of functionality required at the CAT RFCs to migrate to CHPS. BOC document for the CAT RFCs is now complete.
- Joe Gofus was assigned leadership of the OHD CHPS software development team which will focus on converting NWSRFS models to CHPS.
- A CAT-OHD-Deltares workshop was held June 17-19 in Silver Spring, MD
- Karel Heynert from Deltares gave a Delft-FEWS presentation to the Integrated Water Resources Science and Services (IWRSS) workshop participants on June 16.
- Deltares delivered to the CAT a proposed set of hardware specifications.
- HSEB submitted to NOAA Procurement a request for quotes based on final specifications drawn up by OHD, OCWWS, and Deltares for a partial system (i.e., without a duty standby, and without an offline system). The goal is to install this partial CHPS system at CAT sites in October 2008.
- HSEB initiated a "chps_info" mailing list to broadcast information and attempt to familiarize subscribers with terminology; also a new rfc.chps@noaa.gov email account was created as a supplemental way of disseminating CHPS information.
- Deltares is waiting for authorization from NOAA Procurement to proceed with work on the HEC-RAS adapter. Funds for HEC were transferred to the USACE at the end of June; HSEB is waiting for HEC to advise when they can begin work.

4th Quarter FY08

- After Raytheon declined to submit a joint proposal with Deltares for CHPS implementation under the AWIPS contract, NOAA proceeded with a sole source solicitation from Deltares (ref. solicitation number NWWC0000-8-39992 on FedBizOpps.gov). A contract was awarded on September 17.
- CHPS web page (http://www.nws.noaa.gov/oh/hrl/chps/index.html) was re-designed and updated in August.
- CHPS Preparation Workshop #2 was held at NERFC in Taunton, MA during the week of September 29.
- Deltares led a Usability Analysis meeting during the week of August 4, beginning the process of designing a user interface for Delft-FEWS that will meet the need of NWS forecasters. Initial

screen mock-ups were developed and presented to representatives from all 4 CAT RFCs.
- HSEB modified the NWSRFS "ofsde" program to deliver files for CHPS. The new version was successfully tested at NWRFC.
- HSEB began implementation of changes to support run-time modifications (MODs) based on design information provided by Deltares.
- HSEB completed the purchase for prototype hardware, to be delivered to the CAT RFCs in October.
- HEC began work on the changes to RAS; the task for Deltares through the RTi/AHPS contract was awarded. RTi has scheduled a kick-off meeting for the start of October. HSMB continued to make good progress with their task on the project (see status report for "Transition from FldWav to HEC-RAS").
- Deltares visited NERFC on August 14-15 to provide first level FEWS training to RFC staff. Some additional training was provided to NERFC after the Workshop #2. NERFC will now also be the primary site for testing the HEC-RAS implementation in CHPS.
- On September 8, HSEB made its first delivery to Deltares of most of the migrated models; Deltares tested them in their facility during September.
- The NWS Employees Organization (NWSEO) nominated Ron Horwood, Senior HAS Forecaster at NERFC, to be the bargaining unit's representative to the CHPS project.
- HSEB presented a CHPS project status update to OSIP Gate 3 on September 23.

1st Quarter FY09

- CHPS prototype hardware delivered and installed at all 4 CAT RFCs. "Mod note" developed by OCWWS HSD (Randy Rieman).
- FEWS server software installed at NERFC and NWRFC (ABRFC and CNRFC due next quarter).
- CHPS Data Forcings team created to develop short and long term strategies for providing grids and other forcings to CHPS (lead: Mark Glaudemans)
- Harold Opitz, Joe Intermill (both NWRFC), and Ron Horwood (NERFC) attended Software Acceptance Testing in Silver Spring. Goal was for Deltares to demonstrate to OHD that BOC operations migrated from NWSRFS work the same when plugged into FEWS as when run independently of FEWS (i.e., standalone). Individual operations did well, and the source of most discrepancies was identified. Forecasters were additionally able to run catchments end-to-end using FEWS, although the results were not always correct due to the known individual operation discrepancies.
- Jon Roe gave a CHPS presentation to the new Director of OS&T (Don Berchoff). Berchoff requested more information on the hardware issue (ref. Issue 4Q FY08), which was delivered to him on Dec 31; OHD expects OS&T follow-up during January.
- HEC delivered a Linux-based version of the RAS to Deltares on Dec 8; this now permits Deltares to finalize the RAS-FEWS adapter development and testing.

2nd Quarter FY09

- OCWWS HSD completed hardware and software installations at remaining CAT RFCs.
- Began next phase of introducing other RFCs to CHPS. 9 follow-on RFCs now referred to as "CAT-II"
- OHD provided monthly status briefings to CAT-II and Regions on January 8, February 12, and March 12
- OHD supported the CAT members on "CHPS Day" during the national HIC conference on February 26
- Weekly conference calls with CAT-II initiated on March 10 (led by Rob Hartman, HIC CNRFC); focus has been getting requirements captured ("BOC-II")
- CHPS Migration training (for the CAT) held at the NWSTC, Kansas City, MO the week of February 9. This was followed by on-site visits by Deltares to CAT RFCs to help with migration kick-off
- Formal start of CAT Migration from NWSRFS to CHPS: 2/17/09. At end of Q2, ABRFC had completed migrating ALL their NWSRFS segments!
- CHPS Preparation Workshop #3 (for the CAT) was held in Silver Spring, MD the week of January 26
- CHPS Implementation Workshop #1 (for the CAT) was held at CNRFC in Sacramento, CA the

week of March 30

- New infolists set up: cat_2 (for CAT-II information sharing); chps_ops (for migration support and information sharing). New operational support email set up: nws.chps_support@noaa.gov
- OHD delivered first release of modeling software for CHPS; Software Acceptance Testing (SAT) for integrated package (FEWS + OHD software) scheduled for week of April 6
- OHD began work on models required by CAT-II sites ("BOC-II")
- CHPS Data Forcings team met approximately weekly; CAT has focused heavily on the implementation and use of GFE, MPE/DQC, and local applications for BOC. OHD also began work on a temperature processing software application. OHD began to consider requirements for and approaches to CHPS forcings for the CAT-II RFCs.
- Deltares resumed work on the expanded FEWS Interactive Forecast Display (IFD) for the CHPS project. Design meetings (screen mockups, prototypes) began on March 4.
- OHD and Deltares began to document requirements for a CHPS Calibration capability, which will be implemented using a new Application Programming Interface (API) to the FEWS infrastructure provided by Deltares.
- Dates for HEC-RAS training were finalized as follows: basic/steady-state provided by HEC in Davis, CA for all CAT and CAT-II RFCs – April 13-17; advanced/unsteady-state provided by OHD HSMB in Taunton, MA for CAT – April 28-May 1 (lecture portions to be presented as webinars, so CAT-II can also attend)
- Issues (see 2nd Quarter FY09 below) resulted in the agreement between OHD and Deltares to include displays for HEC-RAS as part of the general CHPS Interactive Forecaster Displays
- A "national CHPS workshop" evolved into two events: 1. "buddy visits" where CAT RFCs travel to their partner RFCs with Deltares and OHD during May, June, and July to introduce the CAT-IIs to CHPS; 2. A CAT-II Preparation Workshop #1 in September. CAT-CAT-II partnerships are as follows: NERFC/MARFC & OHRFC; ABRFC/WGRFC & LMRFC & SERFC; NWRFC/APRFC & MBRFC; CNRFC/CBRFC & NCRFC.

3rd Quarter FY09

- Deltares continued work on the expanded FEWS Interactive Forecast Display (IFD) for the CHPS project; after a series of screen mock-up reviews, Deltares developed and delivered a demonstration version of the IFD to the CAT RFCs at the end of April.
- A significant amount of Deltares and OHD time was dedicated in the support of migration activities for the 4 CAT RFCs. OCWWS HSD also participated.
- OHD continued work on CHPS-based modeling software required by the CAT-II sites ("BOC-II").
- OHD's CHPS Data Forcings team completed development of a software application to transform netCDF grids into GRIB(I) for ingest into CHPS. OHD also implemented some CHPS-related enhancements to MPE/DailyQC. Team members worked closely with Deltares to demonstrate that these AWIPS-generated grids were successfully ingested by FEWS.
- Software Acceptance Testing (SAT) occurred in Silver Spring at OHD during the week of April 6; another SAT occurred during the week of June 15. Forecasters from the CAT RFCs attended both; the NWSEO representative also attended. An early version of the IFD was included for the first time in the June tests.
- "Buddy" visits to introduce CAT-II RFCs to the CHPS project, identify initial CAT-II basins for configuration within FEWS, and provide a list of pre-implementation tasks began in May. Eight of the nine CAT-II RFCs were visited during Q3; the final CAT-II visit to NCRFC will occur in Q4. A small number of new BOC-II requirements surfaced during these visits.
- During May and June, Deltares completed another round of site support visits for each of the CAT RFCs; additional training and familiarization was provided. The CAT RFCs are now expected to finish up their migration activities in the early part of Q4 (delayed from Q3).
- A CHPS Implementation Workshop #2 for the CAT RFCs was held in Portland, OR at NWRFC during the week of June 22, 2009.
- OHD provided monthly status briefings to CAT-II RFCs and Regions on April 9, May 14, and June 9.
- Purchase of the second set of prototype hardware for the CAT RFCs and the first set of hardware for the CAT-II RFCs was initiated in June. Delivery is expected to be in early October 2009.
- Deltares and HEC met at the Resource Management Associates (RMA) facility in California

during the final week of June to address outstanding technical issues with interoperability between FEWS and the Linux version of RAS. During this visit Deltares provided the necessary training for RMA to assume RAS-FEWS adapter software ownership and maintenance.
- During June Deltares demonstrated to NERFC a Linux version of HEC-RAS and the associated FEWS adapter as part of their CHPS configuration. A further demonstration was provided to OHD and the CAT forecasters during SAT in June.
- During the week of April 13 HEC conducted a basic (steady-flow) course for all RFCs.
- During the week of April 27 OHD HSMB provided the CAT RFCs with hands-on training at NERFC (Taunton, MA) in advanced HEC-RAS topics (unsteady flow)

Problems Encountered/Issues:

1st Quarter FY08

- An outstanding issue concerning ResSim's ability to execute a warm start in the manner expected by RFC forecasters was never resolved. As the necessary changes to ResSim would be extensive, CNRFC agreed that their plan to move forward with ResSim in their operations could proceed with minor impact. The USACE HEC will submit a proposal to the YCWA to make the necessary design and code changes to ResSim. This HEC activity will delay Phase 2, which is expected to add processing of ensemble forecasts in ResSim.

2nd Quarter FY08 – None

3rd Quarter FY08

- As we approach the final quarter for FY08 we expect NOAA Procurement to be slow to respond to CHPS-related spending requests. Delays may jeopardize the CHPS schedule.
- The CAT continues to struggle with ways to involve all RFCs. GoTo meetings, Webinars, and the like have been suggested but have never materialized. The lack of a signed contract between OHD and Deltares hinders HSEB's ability to task them. The DOH workshop in July holds some promise.

4th Quarter FY08

- Although the Hydrology program purchased the initial prototype hardware for CHPS, it is unclear what the future strategy will be, given that the AWIPS budget through 2012 contains no provision for increased computing resources at RFCs, and given that the Hydrology budget does not cover hardware (or sustaining support thereof). OS&T has imposed a requirement that CHPS must function within the same performance envelope as NWSRFS. OSIP project 07-059 ("RFC AWIPS Configuration") will identify computing needs for RFCs based on NWSRFS, but not for CHPS.

1st Quarter FY09

- Completion of necessary tools by Deltares to allow CAT RFCs to begin migration slipped by one month, pushing the milestone from Q1 FY09 to Q2 FY09.
- A national CHPS workshop was pushed out by the CAT, to the Summer of 2009 (estimate Q4 FY09).
- Syllabus for HEC-RAS training, scheduled for 2Q FY09, has been changed to provide all RFCs with basic (steady flow) instruction. CAT RFCs require advanced (unsteady flow) training – OHD HSMB agreed to provide this training itself (dates to be determined).

2nd Quarter FY09

- Some technical problems with FEWS-RAS adapter arose during this quarter, but they are expected to be resolved during Q3
- A concern regarding ownership and maintenance of the HEC-FEWS software adapters (for HEC-RAS and for HEC ResSim access to FEWS) was addressed during this Quarter. OHD will meet with HEC on April 1 in Sacramento, CA. This issue meant that software maintenance training by Deltares for HEC has been deferred until early Summer; which also resulted in a necessary extension to the contract and a new deliverable date of Q3. This is still in time for BOC, but it increases the risk to the project, as the CAT RFCs must wait longer to test CHPS/HEC-RAS.

3rd Quarter FY09 - None

Dissemination (Web Pages)

AHPS Web Page Activities

Core Goal: Generate and disseminate information to and for our users

Management Lead: Donna Page

Objective: Provide a standard look and feel for the presentation of AHPS hydrologic and forecast information on the World Wide Web by all NWS weather offices. Also, complete the implementation of a single national database that aggregates information on hydrologic observation and service locations used by WFOs and RFCs (National Rivers Location Data Base - NRLDB).

Milestones

Task	Due Date	Status
1. Phase VI development and testing	FY08 Q3	In progress
2. Phase VI deployment	FY08 Q4?	Depends on web consolidation
3. Phase VII definition	FY08 Q3	Delayed to FY08 Q3
4. Phase VII development	FY09 Q1	Not started

Accomplishments/Actions

1st Quarter FY08
- Provided 5 Texas inundation locations for review by Government on AHPS staging server.
- Worked on new inundation water-depth process to merge Triangulated Irregular Network (TIN) and Digital Elevation Model (DEM) datasets for Texas and North Carolina locations.
- Finished beta version of new hydrograph generation software for future consolidated web-farms. Waiting to test on AHPS backend blade servers.
- Started documenting NRLDB tables to move to AHPS-CMS database for web operations.

2nd Quarter FY08
- Started processing new inundation data for 10 Texas and 1 North Carolina location.
- Worked with OCWWS and South Region Headquarters on QC processes for 5 Texas inundation locations.
- Finished work on two new inundation water-depth processes.
- Worked on documenting NRLDB to move to AHPS-CMS database for web operations.
- Started working with AHPS blade server on NWS HQ web-farm

3rd Quarter FY08
- Implemented four inundation locations in Texas.
- Provided nine new inundation locations for review by OCWWS and Southern Region Headquarters
- Started work on inundation zoom feature overlap which was requested by OCWWS
- Implemented development CMS database at HQ web-farm
- Started processing NWS HML products to create hydrographs on HQ AHPS blade servers

4th Quarter FY08
- Implemented nine inundation locations along the Gulf Coast
- Based on discussions with and algorithm approval by OCWWS and NOAA Coastal Services, modified the inundation water depth shapefile TIN/DEM merge process to improve on shallow water depth estimates.
- Updated beta version Web-HydroGen code to fix known issues.
- Worked with OCWWS to reestablish NRLDB version 2 process and deployment testing

1st Quarter FY09

- Worked with OCWWS HSD to test NRLDB version 2 and made code changes at their request
- Delivered four LCRA inundation sites for review by WGRFC
- Worked on development and implementation of new database driven HIC web site
- Worked with Web CCB to implement/test AHPS Phase VI checklist dependencies

2nd Quarter FY09

- Worked with OCWWS HSD to test NRLDB version 2 and made code changes at their request
- NRLDB version 2 now deployed at all WFOs
- Updated inundation data for LCRA inundation sites per request by WGRFC
- Implemented new database driven HIC web interface
- Worked on implementation AHPS Phase VI checklist

3rd Quarter FY09

- Processed new inundation locations and provided staging of data for review
- Updated inundation locations and worked to deploy on SRH web-farm
- Worked on implementation of AHPS Phase VI checklist

Problems Encountered/Issues

1st Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning
- Continued issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue
- New text product issue caused missing NWS products for all AHPS pages. NWS OCIO is aware of issue and has indicated that they will address their PHP code.

2nd Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning
- Continued to have issues with missing products in HQ product database. NWS OCIO is aware of the ongoing issue

3rd Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning

4th Quarter FY08

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning

1st Quarter FY09

- Delays in web consolidation hardware implementation adversely affecting AHPS Phase VI
- Delays in web consolidation data/file synchronization adversely affecting AHPS Phase VI development
- Delays in obtaining necessary web consolidation documentation from OCIO adversely affecting AHPS Phase VI development architecture planning

2nd Quarter FY09 - None

3rd Quarter FY09

- Database system at NWS HQ had several outages during the period.

Western Water Supply Forecast Service Improvement

Core Goal: Dissemination

Management Lead: Kevin Werner

Objective: Improve western water supply forecast services by incorporating all NWS water supply forecasts, ensemble forecasts, forecast verification, and data access into web services.

Milestones

Task	Due Date	Status
1. Launch enhanced web site for water supply and water resources outlooks	Q1	Complete
2. Develop goals for CY09 developments	Q3	In Progress
3. Develop new capabilities based on goals in (2)	Q4 / FY10Q1	-
4. Conduct outreach activities at water management meetings	Q4	Ongoing
5. Pass OSIP gate 2	Q4	-

2nd Quarter FY08

- Outreach Activities (travel funded by this AHPS project):
  - Verification Workshop: In partnership with the Western Water Assessment RISA and the NRCS, NWS organized a verification workshop targeted at water managers in Colorado. The workshop was held in February 2008 and was very well attended. About 70 attendees participated in the day long workshop which featured a hands on lab exercise with the web site.
  - Climate Prediction Applications Workshop – The project was presented at the annual CPASW workshop in Chapel Hill, NC in March 2008.
  - Drought Monitor Workshop – The project was presented at the annual Drought Monitor Workshop in Portland, OR in October 2007.
- Planning Meeting: Planning meeting is scheduled for May 2008 in Boulder, CO. An agenda is available upon request.
- Hardware Support: NWRFC is current scoping hardware to support the project.
- Contract Support: NWRFC contractor is currently supporting project through WR FY07 funding. Expect to establish a contract under this project during Q3.

3rd Quarter FY08

- Outreach Activities (travel funded by this AHPS project):
  - Western Snow Conference – Project presented at annual western snow conference in Hood River, OR on 4/16
  - USBR/USACE/USBR Pacific Northwest Meeting in Portland, OR on 5/6
  - Montana Hydrology Meeting in Great Falls, MT on 5/27
- Planning Meeting: Planning meeting was held in Boulder, CO with NOAA ESRL scientists, western water assessment, and USBR personnel. Major outcomes include the following enhancements planned for a fall 2008 release:
  - Enhanced map interface for ESP forecasts and observed streamflow
  - Improved look and feel for web presence
  - Capabilities for non water supply forecast points from any RFCs
  - Climate change sensitivity studies
- Hardware Support: Hardware is on order through Dell to support project
- Contract Support: NWRFC contractor (Heydt) under contract to maintain a portion of the existing code
- OSIP Status: Documentation has been submitted for OSIP gate 1. OCWWS (Mullusky) is

working on gate 2 documentation.

- Budget: Expenditures to date:
  - Travel (outreach + planning meeting) = $10,023.08
  - Hardware = $20347.90
  - Contract support = $8,000 ($4k for training government employees; $4k for contractor)
  - Total spent to date: $38,370.98

4th Quarter FY08

- Development on forecast verification and water resources outlook continued
- Monthly calls held
- Major web application slated for 1st Quarter FY09
- Plans laid to bring in other RFCs for water resources outlook leveraging ESP at each office.
- Travel funded from this AHPS project:
  - Paul McKee (WGRFC) visit to CBRFC for training
  - Kevin Werner visit to Tucson for meeting with CLIMAS
- Additional computer hardware purchased for NWRFC web server and CBRFC development
- Linux training provided to 2 CBRFC employees

1st Quarter FY09

- Project passed OSIP gate 1 and OSIP IWT formed for gate 2
- Web site reviewed by participating RFCs
- Ongoing development addressed review comments and suggestions
- Briefing conducted for all RFCs, regions, and NWSH personnel on status and potential for a nation wide water resources outlook in Nov 2008
- All RFCs except APRFC named a focal point to work with on including their AHPS points in the national water resources outlook
- CBRFC conducted verification studies using verification tool
- Project presented at fall AGU meeting (Dec), WCM/SCH course (Dec), RFC verification workshop (Nov), Nevada's Colorado River Commission (Dec), and the October NIDIS planning meeting (Oct)
- Planning meeting for FY09 early FY10 developments tentatively slated for late 2nd quarter FY09 depending on FY09 AHPS funding. Meeting would include subset of RFCs. Major new development opportunities include:
  - Expansion of water resources outlook capabilities (e.g. further leveraging existing AHPS products for low flow probabilities)
  - Refinement of database
  - Refinement of climate change capabilities
  - Development of water resources outlook verification
- Continuing to add additional RFCs into water resources outlook as their forecasts and data become available

2nd Quarter FY09

- Launched new version of NWS water supply / water resources outlook website in January 2009
- Integrated ESP forecasts into water resources outlook from the following RFCs: NW, CN, CB, MB, AB, WG, OH, MA, and NE.
- Partially completed ESP integration from SE and LM RFCs
- Project presented at COMET climate variability course (Mar), Climate Predication and Applications Workshop (Mar), and Border Governors Conference (Mar)
- Management briefings held for WRH (Feb) and OHD and OCWWS/HSC (Apr 1)
- Planning meeting for FY09/FY10 developments delayed to 3rd quarter because of budget uncertainty. Targeting early June for planning meeting in Salt Lake to include principles. See 1st quarter report for meeting goals.
- Teleconference for RFCs held in early April to discuss status and future directions
- IWT for OSIP gate 2 work being formed.

3rd Quarter FY09

- Planning meeting scheduled fro July 21-22.
    - Meeting will include participants from CB, NW, NC, SE, and OHRFC as well as NOHRSC and NOAA RISAs.
    - Near term development objectives will be determined at meeting
    - RISAs will facilitate user feedback and marketing plan development
- All RFCs except APRFC are contributing ESP forecasts
- Project presented at WR climate change workshop (Apr), Grand Junction water outlook meeting (Apr), USBR uncertainty workshop (June), and California DWR climate variability workshop (June).
- Teleconferences held in April and June to update progress and help planning.

Problems Encountered/Issues

2nd Quarter FY08 – None

3rd Quarter FY08 - None

4th Quarter FY08

- NWRFC contractor was awarded substantially smaller contract than originally planned. Federal employees conducted much of the development originally slated for the NWRFC contractor. Therefore some of the budget was applied toward training for federal employees instead of outside contractor.

1st Quarter FY09

- Web site deployment delayed until early 2nd quarter FY09 due to conflicting schedules and unforeseen difficulties addressing key comments
- No APRFC focal point named for water resources outlook

2nd Quarter FY09

- Planning meeting delayed to late 3rd quarter due to budget uncertainties
- 2nd quarter travel activities financed on “credit” since budget was not available.

3rd Quarter FY09

- Planning meeting delayed to early 4th quarter (July 21-22)

New Service Locations

AHPS Implementation APRFC

Management Lead: Ben Balk, APRFC

Objective: Implement probabilistic hydrologic forecasts for basins in the Alaska/Pacific Forecast Center's (APRFC) area of responsibility.

Milestones

Task	Forecast Points Planned	Due Date	Actual to Date 3rd Qtr FY09	Variance
Identify 15 potential basins for new calibrations		1st Qtr	Complete	
Calibrate 15 new basins for non-AHPS implementation	15	4th Qtr	9	6
Implement 15 new forecast points (non-AHPS)	15	4th Qtr	9	6
Identify 12 locations for AHPS implementation for FY08		1st Qtr	Complete	
Recalibrate and prepare historical time series for 12 existing non-AHPS basins to utilize new data sources and improve forecast performance	12	4th Qtr	12	0
Implement 12 new AHPS points	12	4th Qtr	12	0
Total	**12**		**12**	**0**

Accomplishments/Actions

1st Quarter FY09
- Identified 12 new AHPS points that will be implemented this fiscal year.
- Performed recalibrations and extended historical times series for 11 of these basins.
- Identified 15 new basins to calibrate. Began data collection and analysis.
- Identified additional previously calibrated basins (non-AHPS points) that have not performed well. Began calibration process to add new data sources and improve model parameters.

2nd Quarter FY09
- Completed calibration of 7 new basins, but have not implemented new forecast points.
- Completed data collection for an additional 3 basins, but have not started calibrations.

3rd Quarter FY09
- Implemented 7 new basins into NWSRFS. Doing internal evaluations of model performance of these basins. Plan to turn into official non-AHPS forecast points sometime in the 4th Quarter FY09.
- Completed calibration of 2 new basins and have implemented new non-AHPS forecast points.
- Implemented 10 additional AHPS points. Completed requirement of 12 new AHPS points.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09
- Reduced staffing during March and April. Our DOH was detailed to the ARH for two months.

3rd Quarter FY09

- Extremely busy breakup flood season halted any development during May. The combination of DOH detail to ARH and breakup will prevent completion of 6 additional calibrations this FY.

AHPS Implementation for NCRFC

Management Lead: Scott Dummer, HIC/NCRFC

Objective: Implement probabilistic hydrologic forecasts for basins in the North Central River Forecast Center's (NCRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 2nd Qtr FY09	Variance
Fox River			2nd Qtr	+1
Des Moines River			2nd Qtr	+1
Cedar River			2nd Qtr	+1
Total	**0**		**0**	**+3**

Note: NCRFC has implemented all the probabilistic points we can within our area of responsibility. We are now reliant on getting further probabilistic information from MBRFC.

Accomplishments/Actions

1st Quarter FY09
- N/A

2nd Quarter FY09
- Added three forecast points
  - Fox River – Montgomery, IL
  - Des Moines River – Eddyville, IA
  - Cedar River – Waverly, IA

3rd Quarter FY09
- N/A

Problems Encountered/Issues

1st Quarter FY09
- N/A

2nd Quarter FY09 - None

3rd Quarter FY09 - None

AHPS Implementation for MBRFC

Management Lead: Steve Predmore, HIC

Objective: Implement probabilistic forecasts for basins in the Missouri Basin River Forecast Center's (MBRFC) area of responsibility. For FY09 this includes the South Platte Basin below Kersey, CO, the Upper Smoky basin in Kansas, portions of the Platte River basin in Nebraska, Tongue River and Powder River portions of the Yellowstone basin in Wyoming and Montana, water supply locations in the Upper Missouri River basin, and reservoirs in the Niobrara River basin in Nebraska.

Milestones

Implementation Area	Forecast Points Planned	Due Date (Quarter)	Actual to Date (3rd Qtr FY09)	Variance
South Platte Basin below Kersey, CO	6	2	6	0
Portions of Platte River basin in Nebraska	9	4	0	-9
Portions of Yellowstone basin in WY and MT	6	4	0	-6
Water Supply Points in the Upper Missouri River Basin in MT	8	4	0	-8
Upper Smoky Basin in KS	11	4	0	-11
Niobrara Reservoirs in NE	2	1	2	0
Total	42		8	-34

Accomplishments/Actions

1st Quarter FY09
- Added two reservoirs Box Butte and Merrit in Nebraska

2nd Quarter FY09
- Added six forecast point for the South Platte Basin below Kersey, CO

3rd Quarter FY09
- Work continuing for implementation of probabilistic forecasts points in Nebraska and Montana

Problems Encountered/Issues

1st Quarter FY09 - none

2nd Quarter FY09 – none

3rd Quarter FY09 - none

AHPS Implementation for MARFC

Management Lead: Peter Ahnert (HIC/MARFC), Joe Ostrowski (DOH), Patti Wnek (SCH)

Objective: Implement probabilistic hydrologic forecasts for basins in the Middle Atlantic River Forecast Center's (MARFC) area of responsibility. MARFC implemented basic AHPS for existing forecast points in the entire MARFC area of responsibility in FY 2006.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1st Qtr FY09)	Variance
Total	**0**			

Accomplishments/Actions

1st Quarter FY09

- MARFC has completed basic AHPS implementation for its entire service area.

- AHPS Outreach:
  - MARFC's SCH gave a presentation on AHPS products and services at the annual meeting of the New Jersey Association of Floodplain Managers in Cherry Hill, NJ.
  - MARFC's SCH gave a presentation on MPE to coastal services staff of the Maryland Dept of the Environment, Baltimore, MD. The data will likely be used to help decision-makers that regulate access to public bathing beaches.
  - MARFC's HIC and SCH staffed a MARFC exhibit booth with AHPS education materials at the office dedication-open house for WFO Sterling, VA. In addition to the general public, attendees included congressional representatives and NOAA leadership.
  - MARFC continues participation in the ER Outreach Display Replacement team to ensure the inclusion of AHPS.

- Hydrologic Modeling:
  - MARFC has contracted Riverside Technology Inc. (RTi) to calibrate the Sacramento SMA rainfall-runoff model, the SNOW_17 model, and unit hydrographs for 5 headwater basins in the Susquehanna drainage. This was supported by the Susquehanna River Flood forecast and Warning Initiative.
  - MARFC met with RTi and received an update on their work to calibrate the Sacramento SMA rainfall-runoff model, the SNOW-17 model, and unit hydrographs for 5 headwater basins in the Susquehanna drainage. RTi also provided MARFC with training on the Sacramento Model.
  - Calibration was completed on 2 of the 4 basins for the 1-hour lumped API-Continuous model. (1st step in distributed modeling).

- Multisensor Precipitation Estimator
  - MARFC expanded MPE operational implementation to 100% of their forecast area.
  - MARFC completed development of hourly and daily maps that show the difference between MPE and QPF for the same time period. These are useful tools for river forecast operations.

- National Verification Team:
  - MARFC continued to participate in the National Verification Team.
  - MARFC is using the Ensemble Verification System to analyze two years of precipitation estimates for the Juniata basin.
  - MARFC attended the National Verification Workshop in Salt Lake City, UT. They completed work on a case study to learn and evaluate the new software.

- GIS Map Enhancement:
  - A Penn State Univ student volunteer at MARFC completed her project to use GIS to add topography to the RFC basin maps. The maps will be used by MARFC hydrologists in daily river forecast operations.

- CoCoRaHS:
  - 543 stations are now in use, with an additional 151 evaluated and deemed unreliable for implementation.

- Training
  - MARFC staff participated in Go-to-Meeting teletraining sessions on:
    - Recent research on calibrating the Sacramento Model.
    - Recent work in short range quantitative precipitation forecasting and its application in hydrologic prediction in the Czech Republic.
  - OHD visited MARFC and provided briefings on River-Estuary-Ocean modeling and Distributed Hydrologic Modeling.
  - MARFC participated in the NWSCHAT for RFC(s) webinar to learn more about its potential use for communicating with MARFC partners.
  - MARFC staff participated in the following webinars: 2-D Modeling of River Estuary and Ocean Interactions. Western Region Water Resource Outlook

- Ensemble River Forecasts:
  - MARFC worked to improve the reliability of the SREF data feed by moving from the development system to the more production-oriented NCEP files which are supported 24x7.
  - OHRFC and NERFC are now implementing the system developed at MARFC.
  - MARFC is working to incorporate a second 64-bit box, to create a 2 machine cluster for redundancy, and, a network file server, so we can archive the grib files.

- Water Resource Outlook
  - MARFC is developing a local water resource outlook.

- QPF
  - Testing and development work continues to integrate GFE into operations. A first test QPF was created for MARFC basins this month.

2nd Quarter FY09

- Hydrologic Modeling:
  - Calibration work was completed on 4 basins for the 1-hour lumped API-Continuous model. These basins are now in a test-mode for evaluation.
  - Attended meetings at College Park, MD and Falls Church, VA concerning modeling in the Chesapeake Bay watershed.
  - Worked with OHD to generate PQPF ensembles to support MARFC cooperative project with SUNY Brookhaven.
  - MARFC began preparation for the migration to CHPS through participation in new weekly conference calls. They are also working on the Basic Operation Capability document in conjunction with the other CAT2 RFC(s).

- GIS Map Enhancement:

- A Penn State University student volunteer at MARFC completed her project to use GIS to add topography to the MARFC basin maps. The maps will be used by MARFC hydrologists in river forecasting operations.

- Hydrologic Verification
  - MARFC completed a case study for the NWS Hydrologic Verification Team using the Ensemble Verification System (EVS).
  - MARFC assisted contractor (RTi) by providing data and participating in meetings for their SAC-SMA calibrations.
  - MARFC is designing local verification of flood forecasts and QPF for our staff.

- Training
  - MARFC participated in a CIPS Coastal Inundation mapping webinar
  - MARFC participated in a CHPS Introduction for RFCs webinar
  - Two senior hydrologists traveled to Colorado to receive training from Riverside Technologies, calibrating several points in the headwaters of the Susquehanna basin for the SAC-SMA model.

- Water Resource Outlook
  - MARFC completed development of a new local water resource outlook (WRO) service. The "WRO" is now under review by Eastern Region for consideration as a new experimental product.
  - National Water Resource Outlook – MARFC is working with NWS Western Region to process and automate MARFC-generated probabilistic forecasts for display on the National Water Resources Outlook webpage.

- QPF
  - MARFC completed initial set-up and configuration of GFE.

- Outreach
  - MARFC continues participation in the ER Outreach Display Replacement team to ensure the inclusion of AHPS.
  - Worked with ERH HSD to plan a generic ER briefing package to be used for FEMA conference calls. The package may be expanded for use by all ER RFC(s).
  - MARFC worked with our collocated WFO CTP to staff an exhibit booth at the Pennsylvania Farm Show. AHPS material was distributed.
  - MARFC completed work on a regional team to mark the 10-year anniversary of Hurricane Floyd with inland flooding outreach and education, namely a webpage dedicated to the anniversary, http://www.erh.noaa.gov/mhx/Floyd/index.php
  - MARFC SCH gave a presentation on the use of NWS Precipitation data as decision support for public health at bathing beaches – at Maryland Dept of the Environment's Annual Beach Conference in Baltimore, Mar 26th.
  - MARFC is now providing the Virginia Dept of Health with MPE precipitation information. Virginia is collecting the daily rainfall total files for use supplementing their routine water sampling and water quality analysis work.

- Ensemble River Forecasts
  - Added snow water equivalent plots to MARFC suite of products.
  - Added Elmira, NY as a relational point.
  - Training presentation given to WFO PHI (Mt Holly)
  - Training presentation given to SERFC
  - Created wiki page to facilitate the creation of Ensemble River Forecast System documentation by 3 ER RFC(s).

3rd Quarter FY09

- Hydrologic Modeling:
  - Calibration work continues on 4 basins for the 1-hour lumped API-Continuous Model.

- Continued to prepare for CHPS migration through conference calls and a Buddy Visit.
- Continued to work with OHD to generate PQPF ensembles to support our cooperative project with SUNY Brookhaven.
- Hosted 2-day CHPS Buddy Visit.
- Monitored real-time performance of the SAC-SMA model in 6 test segments.
- Reviewed contractor's final SAC-SMA project report.
- Redefined all flash flood guidance grids to smooth discontinuities of model parameters at our borders.
- Improved modeling of the upstream routed segment for Conklin, NY to better forecast secondary crests.

- Training
  - MARFC staff participated in the following training opportunities:
    - HEC RAS Steady Flow weeklong residence course
    - WFO CTP Warm Season Workshop
    - NERFC CHPS Implementation
    - New Employee Training Program
    - WFO BGM KINEROS Model webinar
    - CHPS Buddy Visit – Deltares, OHD & NERFC
    - Operational Readiness Exercise on Dam Break
    - OHD Multisensor Precip Reanalysis Webinar
    - COMET 4-day Virtual QPF Course
    - Google Earth: A New Display Tool for Hydro Datasets
    - CLC Precip Estimates Module
    - Hydrology & Hydraulics for Dam Safety Studies PSU Engineering Course
    - Dam Break Operational Readiness Exercise
  - Assisted WFO BGM by developing an MMEFS training drill for their staff.
  - Created hydrology education handouts for use in office tours and outreach events.
  - SCEP student started June 2009
  - New hydrologist completed training program and began solo shifts June 2009.

- Water Resource Outlook
  - MARFC WRO was approved by ERH and was implemented in early May.

- QPF
  - MARFC created and is leading the new ER RFC GFE Collaboration team.

- Outreach
  - MARFC participated in the following Outreach Opportunities:
    - Millersville Univ Career Day
    - Interstate Commission Potomac River Basin (ICPRB) partners meeting – collaborative activities identified and data sharing has began.
    - PEMA State Drought Task Force Meeting.
    - USACE Baltimore District gage funding planning meeting.
    - Penn State University Weather Camp
  - MARFC began providing decision support services for Anne Arundel County, MD Dept of Health. MARFC MPE data is now being used by the county for daily decisions concerning water quality testing and public bathing safety. MARFC supported this project by providing training to their staff, and through daily delivery of data.

- Ensemble River Forecasts
  - MMEFS surveys distributed to all WFO(s) and results summarized.
  - Generalized the code to allow easier implementation at other RFC(s).
  - Added code to accommodate flexibility in OFS for placement of files.
  - Added mapping capability to highlight locations where threat of exceeding critical levels is indicated by color for threat level and by shape for probability level.
  - Added HTML code to isolate those locations where threat level exceedance exists to allow users to focus examination on only those sites.

- Added generation of text file listing exceedance probabilities for all locations and for all threat levels.
- Provided help troubleshooting OHRFC problems.
- Added ability to shut down temperature-related processing if SNOW technique in OFS is off and for RFCs where SNOW model is not used.
- Developed program update distribution system to allow RFC(s) to accept and test new code without affecting operational production.
- OHRFC implemented latest MARFC version of MMEFS.
- Assisted SERFC with their implementation of MMEFS.
- Devised a post-event analysis mechanism.
- Provided 2 training presentations for NWS HQ, National Centers and RFC(s).
- Created and tested prototype MMEFS WFO Feedback Survey for use post flood events.

- Climatology
  - All MARFC floods since 1786 have been identified. Yearly summaries have been written, floods categorized, and weather maps linked.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

3rd Quarter FY09 - None

AHPS Implementation for NERFC

Management Lead: David Vallee (HIC/NERFC), Robert Shedd (DOH)

Objective: Implement probabilistic hydrologic forecasts for basins in the Northeast River Forecast Center's (NERFC) area of responsibility. The NERFC goal is to have AHPS implementation for long-term forecasts for the entire NERFC area of responsibility by the end of FY 2010.

Milestones

Implementation Area	Forecast Points Planned	Due Date FY09	Actual to Date (1st Qtr FY09)	Variance
Southern New England	3	1st Qtr.	3 (1st Qtr FY09)	0
Connecticut River	2	3rd Qtr.	0	0
Housatonic River	1	3rd Qtr.	0	0
Total	**6**	**FY09**	**3**	**0**

Accomplishments/Actions

1st Quarter FY09

- Three new AHPS forecast points were completed in the Southern New England forecast group: Blackstone River at Northbridge MA – (NBRM3); Blackstone River at Woonsocket RI – (WOOR1); and Yantic River at Yantic CT – (YTCC3). Yantic is a carryover from FY08 implementation.

- One new river forecast point was added in the Maine forecast group: Androscoggin River at Auburn ME – (AUBN1). This location is not currently generating ensemble products because there is a portion of the area not currently being modeled. The addition of a new AHPS forecast is on hold until this gets worked out in the near future.

- Two members of the NERFC staff met with the Distributed Modeling group at OHD to discuss procedures for implementing RDHM at NERFC. NERFC would like to have a few test basins available this year.

- NERFC is working with RTi on the FY08 funded calibration project. They also received significant support from RTi on how to improve the implementation of the results from their previous task on the Connecticut River.

- NERFC met with several representatives from the USGS Connecticut and gave presentations providing an overview of NERFC operations including AHPS and CHPS implementation activities.

- NERFC had a joint conference call with RTi and USGS regarding calibration locations on Onondaga Lake in New York. These are potential locations for FY09 calibration in the Oswego River Basin of New York State. It appears that a successful calibration will not be possible at this point due to a lack of sufficient data and the likely requirement to model hydraulically. RTi is continuing to investigate.

2nd Quarter FY09

- RTi is continuing work on the FY08 calibration project. They have found sufficient correlations with nearby gages to adequately calibrate locations in the Finger Lakes Basin at higher flow levels. They are planning on finishing their work in June, and NERFC staff will be traveling to Ft. Collins in May.

- Major activity this month has focused on the start of CHPS migration activities. Two staff members attended the migration workshop in KC. The following week, NERFC had a visit from Deltares staff to help install the work they have done. NERFC has approximately 15 locations now that they can run. This will move into high gear over the next couple of months.

  - NERFC is getting close to implementing locations in the Connecticut River Basin. Several points in the Connecticut basin have been installed in NWSRFS, but AHPS plots are not yet being generated.

3rd Quarter FY09

- Implemented 12 locations with the SAC-SMA in NWSRFS. They are not currently running ensembles, so they can't be counted as official AHPS points yet, but most should be running ensembles in the next 1-2 months.

- Received the final report from RTi on their recent calibration activities including the calibration decks. These will be implemented in NWSRFS over the next several months. Priority will be given to those locations that are replacing existing API models so that we can completely remove the API model in time for our CHPS transition activities.

- The initial CHPS segment migration is nearly complete, although some locations may need to be re-done due to recent updates. There is also still a fair amount of configuration activities required to optimize our use of the FEWS system including some display configuration as well as details such as ensembles configuration. NERFC anticipates starting parallel operations with CHPS in late October or early November.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09 - None

3rd Quarter FY09 - None

AHPS Implementation for OHRFC

Management Lead: Craig Hunter (HIC/OHRFC), Tom Adams (DOH)

Objective Implement probabilistic hydrologic forecasts for basins in the Ohio River Forecast Center's (OHRFC) area of responsibility. The OHRFC implemented basic AHPS for all existing long-term forecast points in the OHRFC area of responsibility in FY 2006.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (3rd Qtr FY09)	Variance
Miami River Basin Forecast Group	0	6/15/2009		
Total	**0**		**0**	**0**

Accomplishments/Actions

1st Quarter FY09

- OHRFC has completed basic AHPS implementation for its entire service area.
- Re-calibration of the Allegheny R basin has begun, including re-analysis of the MAT & MAP time series. Re-calibration of the Great Lakes (Lake Erie) drainage basins using one hour time steps is continuing.
- Work on the Community Ohio River HEC-RAS model continues as a cooperative project with the Ohio R. & Great Lakes Div. of the USACE and the USGS; progress has been achieved in downstream reaches of the Ohio in the OHS forecast group.
- Implementation of the ARW version of the WRF model on the OHRFC Linux cluster is completed. Additionally, the OHRFC is working cooperatively with the NERFC, MARFC, and NCEP to implement a GFS ensemble and SREF-based approach to short lead-time probabilistic hydrologic forecasting; routine 00Z & 12Z GEFSA and 03Z, 09Z, 15Z, & 21Z SREF model runs have been achieved. OHRFC has completed implementation of MARFC's MMEFS system (a modification of NERFC's GENS system), which greatly accelerates processing on a non-AWIPS 64-bit Linux machine.

2nd Quarter FY09

- Work on the Community Ohio River HEC-RAS model continues as a cooperative project with the Ohio R. & Great Lakes Div. of the USACE and the USGS. Significant progress has been achieved in downstream reaches of the Ohio River.
- The OHRFC continues to work in cooperation with the NERFC, MARFC, and NCEP to implement a GFS ensemble and SREF-based approach to short lead-time probabilistic hydrologic forecasting. Routine 00Z & 12Z GEFSA and 02Z, 09Z, 15Z, & 21Z SREF model runs have been achieved. Implementation of MARFC's MMEFS system (a modification of NERFC's GENS system) is complete.
- OHRFC has developed a new continuous water watch product for droughts and floods called the

Water Resources Outlook (WRO) for the Ohio Valley, utilizing the National Weather Service's Hydrologic Ensemble Streamflow Prediction (ESP) system. This is a new way of viewing long range probabilistic forecasts that users can easily understand.

There has been a growing demand by customers for a continuous water watch beyond the currently issued spring flood outlooks. The OHRFC's Water Resources Outlook assists WFO's by filling a gap in RFC services, by providing a continuous water watch for floods and droughts beyond what is presently available. The WRO links USGS flows to NWS forecasts of much below, below, normal, above, and much above normal streamflows.

This is done for the 30, 60 and 90-day periods. Products can be seen at http://www.weather.gov/ohrfc/WRO.shtml . The WRO is available for basins as well as AHPS forecast points. Results for a two-year period show 80% of the basins were forecast in the correct category. The probability of detection (POD) for above average streamflows was 74% with a false alarm rate (FAR) of 17%. The POD for below average streamflows was 64%, with a FAR of 9%.

With extensive positive user feedback from groups including CPC, USGS, Universities, CORPS, Ohio River Valley water sanitation commissions and others; Eastern Region moved the WRO from experimental to operational status.

3rd Quarter FY09

- AHPS RFC Forecast Points – Total RFC supported forecast points is 268
  - OHRFC added three new forecast points in the Miami River Basin in June. These points include:
    Great Miami River at Taylorsville OH – (TAYO1)
    Great Miami River at Middletown OH – (MDTO1)
    Mad River at Dayton OH (Huffman) – (MRDO1)
  - OHRFC upgraded one flood only forecast point to daily in the Miami River Basin in June. The point is:
    Great Miami River below Miamisburg OH – (MBGO1)
  - OHRFC removed Vincennes IN – (VINI3) from operation after coordination with WFO IND in June.

- Site-Specific Headwater Model Forecast Points (SSHP)
  - OHRFC is working with WFO PBZ to develop three new SSHP points. Work was completed on the basin boundaries, rating curves and unit hydrographs for Girty's Run at Millvale PA – (GTYP1), Pine Creek at Etna PA – (PNEP1) and Deer Creek at Dorseyville PA – (DRVP1) in June. Additional work had begun on convective unit hydrographs. These will be delivered to WFO PBZ in the 4th quarter of 2009.
  - OHRFC supports 74 SSHP points for the WFOs with a request for 13 additional points that are being reviewed by OHRFC for support.

- Outreach
  - OHRFC is working with WFO PBZ and Laurie Hogan of ERH to develop a Hydrologic Forecast Process presentation which can be used by WFO(s) across ER for AHPS outreach.
  - OHRFC participated in meetings with the USGS and the City of Findlay on observed and forecast improvements
  - OHRFC held a meeting with the City of Fort Wayne, IN and WFO IWX on performance of forecasts for the City of Fort Wayne and additional needs they would have.
  - OHRFC participated in a meeting on Dix Dam and possible failures with State of Kentucky, City of Frankfort and Kentucky Utilities members.
  - OHRFC participated with Indiana USGS and WFO IND and WFO LMK on performance of USGS Indiana and the use of their products in our mission.

- OHRFC participated with WFO ILN on AHPS outreach at Sinclair Community College in Dayton, OH for a weekend fair.

- Hydraulic Modeling:
  - Work on the Community Ohio River HEC-RAS model continues as a cooperative project with the Ohio River & Great Lakes Division of the USACE and the USGS. 250 additional river miles were completed form Cincinnati to Cannelton in June. Calibration was performed from Cincinnati and downstream and provided to the USACE and LMRFC in June. The project is about 50% complete with a target completion date in FY2010

- Hydrologic Modeling and Calibration:
  - Calibration work was completed on 4 basins for the 1-hour lumped SAC-SMA in the Great Lakes drainage in June. They included Black River at Elyria OH – (ELRO1), Huron River at Milan OH – (MILO1), Portage River at Woodville OH – (WDVO1) and Rocky River at Berea OH – (BRRO1).
  - Re-calibration of OHW forecast group was completed.
  - Re-calibration work was ongoing in the SAW forecast group.

- Training
  - OHRFC provided ensemble forecasting training of the MMEFS to the WFO(s) in 2 Go-to-Meeting teletraining sessions.
  - OHRFC provided an instructor to teach and the training materials for the Climate Change and Variability Course for COMET.
  - OHRFC provided an instructor to teach and the training materials for the QPF Virtual Course for COMET in June.

- Water Resources Outlook
  - National Water Resource Outlook – OHRFC linked the National Water Resources Outlook to the OHRFC Water Resources Outlook. OHRFC participated in WRH meetings in June on expanding and developing the National Water Resources Outlook further. Face-to-face meetings are planned for summer 2009 in Salt Lake City.

- QPE/MPE
  - OHRFC participated in conference calls with NSSL on improvement of Q2.
  - OHRFC analyzed and provided feedback to NSSL on Q2 performance.
  - OHRFC switched to using gage adjusted Q2 as the Best Guess Estimator for the first guess within MPE.

- QPF
  - OHRFC completed initial set-up and configuration of GFE in June.
  - Used GFE for 5-day QPF(s) for contingency Smithland flow forecasts with USACE briefings.

- Ensemble River Forecasts
  - Completed the upgrade to the latest version of MMEFS from MARFC.
  - Gathered user feedback from WFOs on the use of MMEFS
  - Provided training to WFO(s) on MMEFS through 2 Go-to-Meeting teletraining sessions.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09 - None

3rd Quarter FY09 - None

AHPS Implementation for ABRFC

Management Lead: Billy Olsen, HIC

Objective: Implement probabilistic forecasts for basins in the Arkansas-Red Basin River Forecast Center's (ABRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 3rd Qtr FY09	Variance
Lower Neosho River in Kansas	1	1ST Q	1	0
Total	**1**		**1**	**0**

Accomplishments/Actions

1st Quarter FY09

- One new forecast point to report as implemented this quarter. This is a carryover not previously counted from FY-08 implementation on 31 August 2008.
- ABRFC continues to test and implement RES-J calibrations from prior year contract work.
- ABRFC issued all operational AHPS products for the quarter.
- The in-house recalibration of the WKANSAS, HAVARK and VERD forecast groups is complete.
- The script created by James Paul to complete the rsync process on ldad was corrected and worked fine for December.
- The COLRADO forecast group was redefined to include known diversion data operationally and in ESP mode. AHPS calibration has been checked against the historical diversion data.
- Recalibration work is underway on the LWRNEO forecast group.

2nd Quarter FY09

- ABRFC continues to test and implement RES-J calibrations from prior year contract work.
- ABRFC issued all operational AHPS products for the quarter.
- The in-house recalibration of the LWRNEO, EUFINF and WASHITA forecast groups is complete.

3rd Quarter FY09

- ABRFC issued all operational AHPS products for the quarter.
- Corrected errors in the Gibson Reservoir discharge historical time series for the water years 1995-1999.
- ABRFC continues to test and implement RES-J calibrations from prior year contract work.

Problems Encountered/Issues

1st Quarter FY09 –

- The November monthly issuance of ESP graphics was not completed until 12/02/2008 due to an

rsync problem.

2nd Quarter FY09 - None

3rd Quarter FY09 - None

AHPS Implementation for LMRFC

Management Lead: Dave Reed, HIC

Objective: Implement probabilistic hydrologic forecasts for basins in the Lower Mississippi River Forecast Center's (LMRFC) area of responsibility. For FY09 this includes the Pascagoula, Gulf Drainages, Amite/Comite, St. Francis and Black River basins

Milestones:

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1st Qtr FY09	Variance
FY08 Carryover	5	Q1	5	0
Pascagoula Basin, MS	2	Q1	2	0
Mississippi Gulf Drainage Basin, MS	4	Q1	4	0
Amite/Comite Basin, LA	7	Q2	2	5
Amite/Comite Basin, LA	7	Q3	12	-5
St. Francis, AR/MO	7	Q4	0	0
Black, MO	2	Q4	0	0
Total	**34**		**25**	**0**

Accomplishments/Actions

1st Quarter FY09

- FY09 draft SOO completed and awaiting ARC notification on AHPS allocations so LMRFC can begin FY09 market research activities. Also awaiting FY09 Task # assignment by NWS COTR.
- November 3, received all preliminary FY08 calibration decks from RTi for LMRFC review.
- November 21, received 5 revised FY08 calibration decks from RTi for LMRFC review.
- December 12, coordination call held with RTi on FY08 calibration progress and activities. LMRFC awaiting delivery of draft Final report.
- Implemented 6 new AHPS sites for WFO LIX in the Pascagoula (2) and Mississippi Gulf Drainages Basins (4): PGFM6, ORAM6, GLFM6, LYMM6, DIBM6, and KLNM6.
- Provided a brief overview of AHPS activities for the USACE, USGS, and TVA during our annual meetings with these Agencies.
- Completed 2 additional historical MAPs, one each for the St. Francis and Black River in Missouri. Reworked historical MAPs for the Pascagoula, Amite/Comite, St. Francis, and Black basins. Currently developing historical MAPs for the Calcasieu basin, with a total of 11 MAPs.
- Four in-house basin calibrations were completed this Quarter:
    - Pascagoula Basin: VESM6, REDM6, AND WILA1
    - Mississippi Gulf Drainage Basin: BLWM6
- AHPS outreach activities:
    - October 14-16, poster presentation on NWS flood inundation mapping at the NWA Conference held in Louisville.
    - October 28-29, presentation on Storm-Surge Modeling in the Pascagoula Basin at the Bays and Bayou Symposium held in Mobile.

- November 6, in-house visit from LSUHSC Emergency Preparedness Specialist Dr. Alfred Trappey.
- November 12 – 13, presentation on Storm Surge Modeling at the Gulf Coast Hurricane Center (PIANC) held in Mobile.
- November 13, participated in NOAA Sea Grant outreach event at LSU and distributed over 1,000 AHPS brochures in Baton Rouge, LA.
- November 17, Mississippi Civil Defense EMA Meeting in Natchez, MS.
- November 18 - 19, briefed USGS, USACOE, and other NWS offices on LMRFC AHPS activities at the Annual Tri-Agency meeting in New Orleans, LA.

- LMRFC continues support of AHPS activities with in-house calibration effort for remaining basins east of the Mississippi River.

2nd Quarter FY09

- FY08 contract activities near completion. RTi has completed FY08 contractual activities and the T8-0007 Final Report has been approved by HIC.

- Awaiting ARC notification on AHPS allocations so LMRFC can begin FY09 market research activities and awaiting FY09 Task# assignment by NWS COTR. Submitted supporting documentation for FY09 market research.

- Implemented 2 new AHPS sites (DARL1 and OLVL1) and prepared ESP segment definitions to implement CMTL1, DENL1, BYML1, PVLL1, and LPOL1.

- AHPS outreach activities:

  - Jan. 7, in-house visit from HPC Meteorologist Jack Bevin
  - Jan. 20 – 21, participated in Coastal Resiliency Conference, Baton Rouge, LA.
  - Jan. 28, in-house visit from representatives of the Hawaii and Louisiana NOAA Sea Grant offices
  - Feb. 3-4, MEG Hazards Workshop, Memphis, TN
  - Feb. 3-4, USCACE Navigation Workshop, WES, Vicksburg, MS
  - Feb. 19, Meet with St. Tammany Parish Engineer
  - Feb. 27, Gulf Coast Marine Workshop, Lafayette, LA
  - March 2-3, distributed AHPS materials at DOE conference, New Orleans, LA
  - March 3-5, Inland Waterways Navigational Conference held in Nashville, TN
  - March 10, in-house visit from NGI/NOS's Julien Lartigue
  - March 17-18, attended Unstructured Grid Workshop, Bay St. Louis, MS
  - March 25, attended NOAA Tide and Datum Training, Baton Rouge, LA
  - March 26, in-house visit from SRH's Jack Settelmaier

- Completed one in-house basin calibration (SHBM6).

- Prepared and hosted OHD Calibration Workshop at LMRFC, March 9 – 13, 2009.

- LMRFC contacted state floodplain managers in AR, TX and TN to locate potential sites with required hydraulic and terrain data to set up for AHPS static inundation maps. Also coordinated with OHD and WFOs GSP and HUN on potential static inundation mapping sites. So far TKSN7, BIRN7, BLTN7 and CTPN7 have been approved for mapping.

- LMRFC continues support of AHPS activities with in-house calibrations for remaining basins east of the Mississippi River.

3rd Quarter FY09

- Received guidance on AHPS allocations. Revised and submitted supporting documentation for FY09 market research as well as reformatted and re-submitted SOO to facilitate approval process. Awaiting COTR approval of FY09 SOO and Task # assignment by NWS COTR.

- AHPS outreach activities:
  - April 3 and April 13, meet with St Tammany Parish officials and residents on Pearl River Flood impacts, Slidell, LA
  - April 13-17, attended HEC-RAS Steady State Training, held in Sacramento, CA
  - April 16, participated in Press Conference for the 30th Anniversary of the 1979 Pearl River Flood, Jackson, MS
  - April 23, attended NGI Speaker Series at Stennis Space Center, MS
  - April 22-25, attended Louisiana Flood Plain Manager Conference, Covington, LA
  - April 28-May 1, participated in HEC-RAS Unsteady State Webinar
  - May 5, participated in Pearl River Hydraulic Modeling Coordination Meeting
  - May 6, Flood Inundation Mapping conference call
  - May 7, participated in New Orleans FEB's Public Service Recognition Week events, including distribution of AHPS brochures at Mall Outreach Event
  - May 9, hosted outreach booth at the Asian/Pacific American Festival at Audubon Zoo and educated public on various NWS programs, including AHPS, and distributed numerous types of NWS/NOAA literature
  - May 15, visit from Jim Liverett, Louisiana Coast Guard Auxiliary
  - May 15-16, NWS Open House event, VIP day on Friday 5/15 with Emergency Managers and Saturday 5/16 Public Open House where approximately 600 visitors toured the Slidell facilities and learned more about the LMRFC program and services
  - May 19, visit from Mississippi State University Professors
  - May 19-20, QPF Ensemble Meeting at CRH
  - May 19-21, participated in Annual Northern Gulf Institute Conference in Mobile, AL
  - June 10-12, attended Inland Impacts of Tropical Cyclone Conference in Atlanta, GA and WFO FFC/SERFC
  - June 12, attended GNIS Workshop, University of Louisiana at Lafayette in Lafayette, LA
  - June 16, visited the New Orleans USACE Hydrology and Hydraulics Division
  - June 16, tour of office by two University of Southern Alabama students
  - June 18-19, CHPS CAT "Buddy" visit from Edwin Wells (Delftares), Eric Jones and Mike Boehmke (ABRFC) and Chris Dietz (OHD)
  - June 22-23, attended FUSION Team Meeting, Kansas City, MO
  - June 22-26, HEC GeoRAS/Inundation Map Training in State College, PA

- Implemented 12 new AHPS sites for WFO LIX in the Amite, Comite, Tickfaw and Tangipahoa basins (LPOL1, MONL1, HOLL1, NRBL1, OSYM6, KENL1, AMIL1, ROBL1, CMTL1, DENL1, BYML1, and PVLL1).

- Completed four in-house basin calibrations (WYNM6, WILA1, REDM6, and VESM6).

- Coordinating PAH AHPS visit with Mary Lamm for late July.

- LMRFC continues support of AHPS activities with in-house calibrations for remaining basins east of the Mississippi River.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09

- NWSRFS software issues impact the ability to prepare AHPS probabilistic forecasts for additional forecast sites. OCWWS/HSB/RFC support group believes this is due to array size

issues in the NWSRFS FORTRAN code in ESP and LMRFC cannot prepare 90-day probability graphs to support AHPS implementation for Amite/Comite River in LA. Trouble ticket #354848 was opened on 2/17/09 by Lavonne Tongue and DR 20750 was created by Xiaobiao Fan. DR request escalated on 3/6/09. (From March AHPS Report)

3rd Quarter FY09

- HSB/RFC Support continues to address issue from March Report. Shaohua Shen contacted LMRFC on 4/27/09 about this issue with a possible fix. LMRFC tested fix on WES, due to operational flood forecast activities, and was able to implement 3 additional sites. All issues have been resolved and LMRFC is able to run ESP and prepare AHPS probabilistic products operationally.

AHPS Implementation for SERFC

Management Lead: John Feldt, HIC

Objective Implement probabilistic hydrologic forecasts for basins in the Southeast River Forecast Center's (SERFC) area of responsibility. For FY09 this would complete AHPS sites in portions of Georgia, Alabama, and north Florida.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date (1st Qtr FY09)	Variance
Choctowahatchee and Apalachicola	2 4	1st Qtr 1st Qtr	2 4	0
Alabama	9	2nd Qtr	8	-1
Suwannee	6 5	3rd Qtr 4th Qtr	0	**-7**
Total	**26**	**FY08**	6	0

Accomplishments/Actions

1st Quarter FY09

- There has been a request to southern region to replace Maximum exceedance graphs with Mean exceedance graphs. It is believed that these will be more informative to the public and agencies using these products. The outcome of that request is still pending. This has been nixed by both Southern and Eastern regions….the matter is closed.

2nd Quarter FY09 – None

3rd Quarter FY09

- The SERFC has begun sending data to populate the western water resources page for North Carolina and Virginia. It is now being displayed on the western water resources page.
- Briefings for the Corps of Engineers – Savannah cancelled until further notice due to the improved conditions over the basin and in the reservoirs. Briefings the Corps – South Atlantic Division will continue on a monthly basis.
- Continue work on an in-house calibration led by Wylie Quillian in support of the AHPS program.
- Todd Hamill is providing the American Power Company raw ESP output from the Roanoke River at Roanoke for use in their model to more efficiently manage the Smith Mountain reservoir

Problems Encountered/Issues

1st - Quarter FY09 –None

2nd - Quarter FY09 - None

3rd Quarter FY09

- We are still having problems implementing the JAMS1 ESP due to time series constraints due to the way we have it set up in the model. RES-J will be implemented soon and should clear this up.

AHPS Implementation for WGRFC

Management Lead: Thomas Donaldson, WGRFC

Objective: Implementation of probabilistic hydrologic forecasts for the Colorado basin in the West Gulf River Forecast Center's area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1st Qtr FY09	Variance
Total	**54**			

Accomplishments/Actions

1st Quarter FY09

- Assimilated observed streamflow, MAPX, fs5files, and ESRI basin definition shape files datasets and provided to RTi in support of their headwater calibration work scheduled for the Colorado River system under the 2008 AHPS contract:
- Sub-divided basins at LCRA streamgage locations, and delineated new basin boundaries using IHABBS.
- Computed 1 and 6 hour MAPX for Colorado River basins.
- Began effort to compute historical MAPs for use in ESP
- Developed FY 2009 AHPS outreach plan.
- Coordinated with Brazos River Authority on the production of non-baseline AHPS products. Developed procedures to create and disseminate the following products:
    - 30 and 90 Day Flow Exceedance Table
    - 30 Day Weekly Histogram
    - 30 Day Exceedance Plot
- Coordinated FY 2009 implementation points in the Colorado River Basin with all effected WFO's (MAF, SJT, EWX, HGX)
- Began assimilation of reservoir elevation, inflow, and outflow timeseries for Colorado River Reservoir projects to support reservoir modeling.
- Split the Colorado Forecast Group (COLO) into an upper and lower forecast groups (UCOL & LCOL)
- Wrote scripts to semi-automate the process of adding ESP to segment definitions.
- Added ESP to the Colorado Basin segments.
- Coordinated with Brazos River Authority on the production of additional non-baseline AHPS products.
- Provided Donna Page with spreadsheet of proposed work for the Guadalupe and San Antonio River systems in FY 2010. Also provided proposal for additional work required to develop a snow model for the Upper Rio Grande and Pecos basins.

- Created prototype non-baseline probabilistic text products on selected Trinity River forecast points for the Tarrant Regional Water District.

2nd Quarter FY09

- Reviewed the water balance analysis performed by RTi. Provided comments and reviewed updated water balance.
- Collected historical reservoir data from LCRA. Quality controlled the dataset and reformatted into OH Datacard format.
- Performed market research with RTi for potential hydrologic modeling in upper Rio Grande basin.
- Analyzed available data on the Guadalupe and San Antonio rivers in preparation for market research for FY10 contract.
- Completed MAP development for Colorado, Guadalupe, and San Antonio River Basins.
- Compiled LCRA diversion data for lower Colorado and provided to RTi.
- Continued RES-J model development for LCRA and Corps of Engineers reservoirs in Colorado River Basin.
- Compiled station inventory for San Jacinto River system.

3rd Quarter FY09

- Began MAP development for San Jacinto River Basin.
- Completed Reservoir modeling for all Colorado River reservoirs.
- Received model calibrations and write-ups from contractor for Colorado River system.
- Reviewed model calibrations by contractor.
- Performed market research with RTi for 2009 calibration contract.
- SOO for 2009 calibration for hydrologic modeling of upper Rio Grande basin.
- Coordinated AHPS training and outreach for Colorado River implementation.

Problems Encountered/Issues

1st Quarter FY09 – None

2nd Quarter FY09 – None

3rd Quarter FY09 - None

AHPS Implementation for CBRFC

Management Lead: Michelle Schmidt, HIC/CBRFC

Objective: Implement probabilistic hydrologic forecasts in the Colorado Basin River Forecast Center's (CBRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1st Qtr FY09	Variance
Total	**0**		**0**	**0**

Accomplishments/Actions

1st Quarter FY09
- N/A

2nd Quarter FY09
- N/A

3rd Quarter FY09
- N/A

Problems Encountered/Issues

1st Quarter FY09
- Implementation for regulated points is delayed until delivery of new software.

2nd Quarter FY09

3rd Quarter FY09
- Implementation for regulated points is delayed until delivery of new software.

AHPS Implementation CNRFC

Management Lead: Robert Hartman, HIC/CNRFC

Objective: Implement probabilistic hydrologic forecasts in the California-Nevada River Forecast Center's (CNRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1st Qtr FY09	Variance
Total	**0**		**0**	**0**

Accomplishments/Actions

1st Quarter FY09

- N/A

2nd Quarter FY09

- N/A

3rd Quarter FY09

- N/A

Problems Encountered/Issues

1st Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

2nd Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

3rd Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

AHPS Implementation for NWRFC

Management Lead: Harold Opitz, HIC/NWRFC

Objective: Implement probabilistic forecasts for basins in the Northwest River Forecast Center's (NWRFC) area of responsibility.

Milestones

Implementation Area	Forecast Points Planned	Due Date	Actual to Date 1st Qtr FY09	Variance
Total	**0**		**0**	**0**

Accomplishments/Actions

1st Quarter FY09
- N/A

2nd Quarter FY09
- N/A

3rd Quarter FT09
- N/A

Problems Encountered/Issues

1st Quarter FY09
- Implementation for regulated points is delayed until delivery of new software.

2nd Quarter FY09
- Implementation for regulated points is delayed until delivery of new software.

3rd Quarter FY09

- Implementation for regulated points is delayed until delivery of new software.

Training

Hydrologic Science Training - COMET

Core Goal: Provide science and software training on hydrology program applications throughout the research to operations cycle

Management Lead: Mark Glaudemans

Objective: Develop training and education materials to facilitate the implementation of new science and technologies into hydrologic operations.

Milestones

Task (COMET-led unless noted)	Due Date	Status
Estimation of Observed Precipitation Distance Learning Module	To be published 3rd Q FY 2009	Part I completed Q3 FY2009. Part II scheduled for Q4 FY2009
Vertical Datums Distance Learning Module (FDTB)	To be published 2nd/3rd Q FY 2009	Complete
Theory of Hydrologic Ensemble Prediction Distance Learning Module (FDTB)	To be published 2nd/3rd Q FY 2009	Planned for Q4 FY09
Quantitative Precipitation Forecasting Virtual Course	Virtual course to be delivered June 2009	Course presented Jun 2009
Techniques in Hydrologic Forecast Verification Distance Learning Module	To be published 4th Q FY 2009	Planned for Q1 FY10
QPF Verification I Distance Learning Module	To be published 4th Q FY 2009/1st Q FY 2010	On schedule for Q1 FY10
QPF Verification II Distance Learning Module	To be published 1st/2nd Q FY 2010	On schedule for Q2 FY10
Distributed Modeling for Flow Forecast Distance Learning Module	To be published 4th Q FY 2009	Part I on schedule for Q4 FY09. Part II scheduled for Q1 FY10

Accomplishments/Actions

1st Quarter FY09

- Discussions were held with NWS Subject Matter Experts (SMEs) regarding the Precipitation Estimates module. Collaborated with WDTB and NESDIS to determine how we can use each other's material for training in precipitation estimates from radar and satellite. Script revision and graphics development continues.
- Conferred with Dr. Dennis Johnson regarding the next Distributed Modeling module and developed a schedule of deliverables. A contract agreement was made with Dennis who will serve as the Principal Science Advisor for the module.
- Testing of virtual class breakout sessions was conducted. Other testing will be conducted as we prepare for the QPF Virtual Class in June.
- Background research and script development continues on the Theory of Hydrologic Ensemble Prediction module.

2nd Quarter FY09

- N/A

3rd Quarter FY09

- Completed module on Precipitation Estimates, Part I: Measurement, published early June. Additional MPE case data was collected and reviewed with WGRFC in June. Development continues on Precipitation Estimates, Part II, on Analysis, to be completed Q4.
- The Vertical Datums module is complete and is currently available on the LMS site.
- The Theory of Hydrologic Ensemble Prediction is currently still in development, led by by Dr. Rick Koehler of the FDTB. The first draft (graphics and script) is planned to be provided to COMET for review in late July.
- Presented the QPF Virtual Course to 49 student participants in 19 locations, coordinated 17 presenters and five hands-on exercises, and reached an additional 30 students who attended part of the course.
- Techniques in Hydrologic Forecast Verification is in early stages of defining content and outline and is expected this Fall. Conference calls take place routinely with OHD and the RFCs to discuss the approach to verifying the impact of QPF on hydrologic forecasts.
- QPF Verification I (current methods/overview) is in early development and expected to publish in Q1 FY10. The QPF Virtual Course fostered good discussion between experts and forecasters of QPF verification tools within the NWS.
- QPF Verification II (new techniques) will not begin development until later in the fiscal year.
- The Distributed Hydrologic Models for Flow Forecasts Part 1 webcast is currently in production and is scheduled to publish in late-summer. Subject matter expert Dennis Johnson has been working with OHD in planning the content for Distributed Hydrologic Models for Flow Forecasts Part 2, which is targeted for fall publication.

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - N/A

3rd Quarter FY09

- Regarding the Theory of Hydrologic Ensemble Prediction module, the May 2007 XEFS gap report had been used as basic information. In late June, an updated dataflow diagram from OHD was provided to FDTB that is significantly different that the gap report. This has complicated the training module development.
- Regarding the Techniques in Hydrologic Forecast Verification module, there is some uncertainty on the course focus based on the ongoing activities as far back as 2008. Two approaches are being considered:
  1) Make the module more theoretical than practical application and have it done by Q1 FY10.
  2) Keep the module directly applicable to operations which means COMET needs to know what products RFCs will be using a year from now, and needs to have some results on how the QPF time horizon study. That would delay it well into FY10.

Outreach

FY09 Hydrology Program Outreach Work Plan

Core Goal: Inform customers of our information and services, assess their satisfaction, and incorporate comments and feedback into Hydrology Program planning

Management Lead: Tom Graziano, Larry Wenzel, Regional Hydrologic Services Program Representatives

Objectives: Accomplish outreach with national, regional, and local partners and customers with emphasis on locations where AHPS or water resource services are being or will soon be implemented. Develop clear and consistent outreach materials for use by national, regional, and local personnel.

Milestones

Tasks	Org	Cost ($1000)	Due Date	Status
National Safety Council (Includes carry-over from Oct 2008 in Anaheim)	OCWWS	5.5	Q1	Completed
Tri-Agency Conference (New Orleans)	OCWWS	1.0	Q1	Completed
Road Erosion Video (Purchase 1 for each WFO, RFC, Region and NWSHQ)	OCWWS	1.0	Q1	Completed
Purchase/distribute 45 TADD Yellow Warning Signs in support of Hurricane Floyd 10 Year Anniversary	OCWWS	2.5	Q2	Completed
Key Chains (Yellow Warning)	OCWWS	2.0	Q2	Completed
Purchase/Distribute 100 TADD Warning Signs	OCWWS	6.0	Q2	Completed
Reprint The Weather Channel Cyclone: Second Wave DVD	OCWWS	2.5	Q2	Completed
FEMA National Flood Conference (Boston, MA, April 2009)	OCWWS	6.0	Q3	Completed
National Hydrologic Warning Council Conference and Exposition (Vail, CO, May 2009)	OCWWS	20.0	Q3	Completed
Association of State Floodplain Managers (ASFPM) Annual Conference (Orlando, FL, June 2009)	OCWWS	7.5	Q3	Completed
Sub Total		**54.0**		
Participate in AHPS Outreach with NOAA at Delaware Coast Day (MARFC, PHI); Location: Lewes, DE	ER	.3	Q1	Completed
AHPS presentation at New Jersey Association of Floodplain Managers Meeting (MARFC, HSD); Location: Cherry Hill, NJ	ER	.8	Q1	Completed
Participate in RFC/WFO partnered Flood Inundation Mapping Coordination Outreach/Meeting (MARFC, PHI)); Location: TBD	ER	.2	Q1	Cancelled
Meeting with key North Carolina Reservoir Operators to review AHPS product suites and review hydrologic services (SERFC); Location: TBD	ER	.4	Q4	Moved from Q2 to Q4
High Water Mark Signs – Flood Safety Awareness Week: 10-year Hurricane Floyd Anniversary (MHX, AKQ, ILM, RAH, PHI, OKX, LWX); Location: NA	ER	1.2	Q2	Completed
AHPS presentation at New Jersey Emergency Managers Training (MARFC); Location: TBD	ER	.4	Q3	Moved from Q2 to Q4
Participate in State Water Resources Conference to promote AHPS services in State (SERFC); Location: TBD	ER	.9	Q4	Moved from Q2 to Q4
AHPS presentation at Virginia Department of Emergency Management Conference (MARFC, AKQ, RNK); Location: TBD	ER	.4	Q3	Moved from Q2 to Q4
Participate in semi-annual New York City Water Supply Meetings and review AHPS deployment and operations in the NYC water supply system. (NERFC, ALY, BGM, HSD); Location: Grahamville, NY	ER	.6	Q3	Completed
Enhanced Care Taker Program Basin Review Meeting to enhance customer relations reviewing and assessing AHPS services and requirements (SERFC); Location: TBD	ER	.6	Q4	Completed

Participate in partnered Flood Inundation Mapping Coordination Outreach/Meeting (HSD); Location: TBD	ER	.5	Q4	Moved from Q2 to Q4
Coordination Meeting with Interstate Commission on the Potomac River Basin to review AHPS services in the watershed (MARFC, HSD, PHI); Location: Rockville, MD	ER	.5	Q3	Completed
National Hydrologic Warning Council (NHWC) Conference and Exposition (TBD); Location: Vail, CO	ER	.5	Q3	Cancelled
Association of State Floodplain Managers (ASFPM) Annual Conference (BGM); Location: Orlando, FL	ER	.5	Q3	Completed
Meeting with key South Carolina Reservoir Operators to review AHPS product suites and review hydrologic services (SERFC); Location: TBD	ER	.4	Q3	Moved to Q4
Participate in WMO Sponsored-Saint John River Hydrology Committee Meeting. Share AHPS development and deployment activities in northern New England. (NERFC, HSD, CAR, BTV, GYX); Location: Halifax, Nova Scotia	ER	3.0	Q3	Completed
Participate in semi-annual New York City Water Supply Meetings and review AHPS deployment and operations in the NYC water supply system. (NERFC, ALY, BGM, HSD); Location: Grahamville, NY	ER	.6	Q4	
Participate in State Water Resources Conference to promote AHPS services in State (SERFC); Location: TBD	ER	.9	Q4	
Local Media Workshops in New York and New England to promote AHPS services in the Region (NERFC); Locations: TBD	ER	.8	Q4	
Participate in partnered Flood Inundation Mapping Planning Meeting (HSD); Location: TBD	ER	.5	Q4	
Customer Outreach Visits in New York and New England to promote AHPS services and solicit customer hydrologic service requirements (NERFC); Locations: TBD	ER	1.0	Q4	
Sub Total		**15.0**		
ABRFC - Partner workshops (state/regional FEMA offices, water partners) FEMA Region VI, state EM in KS/AR/TX, COE Little Rock	SR	1.8	Q3/Q4	Partially complete
RFC/WFO Workshops (LZK, SHV	SR	1.1	Q3/Q4	Partially complete
High Water Mark Signs	SR	.6	Q4	Partially complete
Lower Colorado River Authority Partners Workshop	SR	.4	Q4	
RFC/WFO workshop	SR	.2	Q4	
Upper Colorado Partners Workshop	SR	.2	Q4	
Texas Flood Plain Managers Meeting	SR	.7	Q2	Complete
Flood Inundation Mapping Outreach	SR	.5	Q4	
Texas Hurricane Conference	SR	.7	Q3	Complete
WFO/RFC workshop (PAH)	SR	2.0	Q4	
Partner workshops (state FPM (MS, LA), EMs (AR), regional FEMA offices (Region VI)	SR	2.0	Q4	Partially complete
~~MS Water Resource Meeting~~	~~SR~~	~~.5~~	~~Q4~~	Will use other funds for this outreach
GA Water Resource Conference	SR	.8	Q3	Complete
National Hurricane Conference	SR	1.0	Q3	Complete
State Emergency Management and Water Resource Conferences	SR	2.5	Q4	
Sub Total		**15.0**		
WAS*IS Workshop	CR	5.4	Q4	Moved to

				Q4
High Water Mark Signs	CR	4.0	Q4	
Support activities of the SCH or SH in support of the SCH Outreach	CR	5.6	Q4	
Sub Total		**15.0**		
Conduct an HPM workshop at the CBRFC	WR	3.750	Q4	Completed
Staff a booth at the Outdoor Retailers' Convention at the Salt Palace Convention Center in Salt Lake City - July 21 - 24, 2009.	WR	3.0	Q4	
Develop and print AHPS brochures for the state of Nevada.	WR	1.5	Q4	
Purchase magnets promoting WFO AHPS services.	WR	1.5	Q4	Completed
Purchase or develop a "hands-on" watershed model. (Jayme Laber)	WR	1.0	Q4	Completed
Purchase or develop a "hands-on" watershed model. (Jay Breidenbach)	WR	1.0	Q4	Completed
Purchase or develop a "hands-on" watershed model.(Brent Bower)	WR	1.0	Q4	Completed
Develop and print brochures on the Western Region Water Supply Web Page.	WR	1.5	Q4	
Partner with Ada County Parks and Recreation to promote AHPS outreach and water safety. Develop a kiosk using new and previously purchased materials.	WR	.750	Q4	
Sub Total		**15.0**		
Outreach material and participation in User Workshop, Anchorage, AK	AR	.525	Q3	Moved to Q4
Participation in User Workshop, Fairbanks, AK	AR	2.0	Q3	Moved to Q4
Participation in User Workshop, Juneau, AK	AR	2.0	Q3	Completed
Sub Total		**4.525**		
Total		**118.525**		

Accomplishments/Actions

1st Quarter FY09

- Worked with the regions to develop the FY09 plan

2nd Quarter FY09

- OCWWS re-adjusted some of the milestones in light of The Weather Channel not in a position to assist with a DVD

3rd Quarter FY09

- A majority of the actions have been completed as shown in the above table

Problems Encountered/Issues

1st Quarter FY09 - none

2nd Quarter FY09

- OCWWS re-adjusted some of the milestones in light of The Weather Channel not in a position to assist with a DVD

3rd Quarter - none

Program Management

Program Management

Theme: Program Management

Management Lead: Donna Page

Objective: Provide national program management; coordinate and track AHPS budgets and project plans; manage AHPS contracts; and foster Agency, Departmental, and Legislative Interface.

Milestones

Tasks/Subtask FY09 Milestones	Responsible	FY09 Quarter Completion Date
AHPS Planning/ Execution/ Reporting		
• Quad Charts	OHD/Regions	Monthly
• E-CPIC Updates	OHD	Quarterly
• Quarterly Status Reports	OHD	Quarterly
NOAA PPBES Hydrology Program Support		
• Program Operating Plan	OHD	3rd
• Quad Charts	OHD	Quarterly
• Quarterly Program Review	OHD	Quarterly
Agency/ Department/ Legislative Interfaces		
• Budget Fact Sheet	OHD	1st
• Prepare and submit Budget Request	OHD	2nd
• Prepare Briefings and Support OMB/Congressional Meetings	OHD	3rd
• Prepare Response to Pass Back	OHD	3rd
• Prepare Response to Budget Hearing Questions	OHD	4th
• Program Assessment Rating Tool Progress	OHD	Quarterly
HOSIP Process Improvement and Document Development		
• Instructions	OHD	Quarterly
• Guidance & Standards	OHD	Quarterly
• Performance Statistics	OHD	Quarterly
• Quality Control Reports	OHD	Quarterly
• Gate Status Reports	OHD	Quarterly
• Validation & Recommendation Reports	OHD	Quarterly
• HOSIP Documents	OHD	Quarterly

Accomplishments/Actions

1st Quarter FY09
- All milestones are on schedule – all scheduled reports completed

2nd Quarter FY09
- All milestones are on schedule – all scheduled reports completed

3rd Quarter FY09
- All milestones are on schedule – all scheduled reports completed

Problems Encountered/Issues

1st Quarter FY09 - None

2nd Quarter FY09 - None

3rd Quarter FY09 - None